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SHOULD WE STAY OR SHOULD WE GO NOW? THE PHYSICAL, ECONOMIC, GEOPOLITICAL, SOCIAL AND PSYCHOLOGICAL FACTORS OF RECOVERY FROM CATASTROPHIC DISASTER

by

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"Should we continue to build there?" is a question asked after other past disasters; it is especially more poignant as local, state and federal governments deal with pre-disaster mitigation funding and post-disaster emergency management funding issues. The goal of this research is to develop a way of answering that question through a better understanding of the social, economic, and cultural problems and opportunities of rebuilding. As a result, shortcomings in the assumptions of existing response and recovery plans can be identified, and current community planning can consider future catastrophic events. Through pre-identification of physical, social, and political limitations other communities have faced, proactive land use, response, and recovery planning decisions could be implemented that increase the chance that communities can successfully emerge from disaster.

This study investigates examples of past catastrophic disasters and the positive and negative experiences as those communities struggled to return to normalcy. The end result of the research is an assessment that identifies the economic, geopolitical, and social factors of recovery following a catastrophic disaster. The research used historical case studies and their challenges with recovery. Based on the case study findings, an analysis was created of the current economic, geopolitical, and social factors in the City of Seaside, Oregon, following a Cascadia Subduction Zone earthquake and tsunami to identify future recovery challenges.

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ABSTRACT

"Should we continue to build there?" is a question asked after other past disasters; it is especially more poignant as local, state and federal governments deal with pre-disaster mitigation funding and post-disaster emergency management funding issues. The goal of this research is to develop a way of answering that question through a better understanding of the social, economic, and cultural problems and opportunities of rebuilding. As a result, shortcomings in the assumptions of existing response and recovery plans can be identified, and current community planning can consider future catastrophic events. Through pre-identification of physical, social, and political limitations other communities have faced, proactive land use, response, and recovery planning decisions could be implemented that increase the chance that communities can successfully emerge from disaster.

This study investigates examples of past catastrophic disasters and the positive and negative experiences as those communities struggled to return to normalcy. The end result of the research is an assessment that identifies the economic, geopolitical, and social factors of recovery following a catastrophic disaster. The research used historical case studies and their challenges with recovery. Based on the case study findings, an analysis was created of the current economic, geopolitical, and social factors in the City of Seaside, Oregon, following a Cascadia Subduction Zone earthquake and tsunami to identify future recovery challenges.

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LIST OF ACRONYMS AND ABBREVIATIONS

ABAG	Association of Bay Area Governments
CASE	Complessi Antisismici Sostenibili ed Ecocompatibili (Anti-seismic, Sustainable and Environmentally Friendly Structures)
CHDS	Center for Homeland Defense and Security
COOP/COG	Continuation of Operations/Continuity of Government Planning
CSZ	Cascadia Subduction Zone
DEW	Distant Early Warning
ESF	emergency support function
FEMA	Federal Emergency Management Agency
HAZUS-MH	multi-hazard natural hazard loss estimation software
HITRAC	Homeland Infrastructure Threat and Risk Analysis Center Office of Infrastructure Protection National Protection and Programs Directorate
LNG	liquefied natural gas
NFIP	National Flood Insurance Program
NISAC	National Infrastructure Simulation and Analysis Center
PTSD	Post-Traumatic Stress Disorder
SBA	Small Business Administration
UGB	urban growth boundary
USGS	U.S. Geological Survey

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EXECUTIVE SUMMARY

This study investigates examples of past catastrophic disasters and the positive and negative experiences as those communities struggled to return to normalcy. The end result of the research is an assessment that identifies the economic, geopolitical, and social factors of recovery following a catastrophic disaster. The research used historical case studies and their challenges with recovery. Based on the case study findings, an analysis was created of the current economic, geopolitical, and social factors in the City of Seaside, Oregon, following a Cascadia Subduction Zone earthquake and tsunami to identify future recovery challenges.

"Should we continue to build there?" is a question asked after other past disasters; it is especially more poignant as local, state, and federal governments deal with pre-disaster mitigation funding and post-disaster emergency management funding issues. The goal of this research is to develop a way of answering that question through a better understanding of the social, economic, and cultural problems and opportunities of rebuilding. As a result of this line of study, shortcomings in the assumptions of existing response and recovery plans can be identified, and current community planning can consider future catastrophic events. Through pre-identification of physical, social, and political limitations other communities have faced, proactive land use, response, and recovery-planning decisions could be implemented that increase the likelihood that communities can successfully emerge from disaster.

Seaside, Oregon, has the most concentrated vulnerabilities of Oregon coastal communities to damage as a result of a Cascadia Subduction Zone (CSZ) earthquake and tsunami,[1] modeled to generate a 9.0 magnitude earthquake and a resulting tsunami 12–80 feet in height.[2] The devastating 2011 Tohoku earthquake and tsunami, being a geologically similar event, can provide some insight as to what damages the Northwest is

[1] Oregon Seismic Safety Policy Advisory Commission, *The Oregon Resilience Plan—Cascadia: Oregon's Greatest Natural Threat* (Salem, OR: State of Oregon, 2012), 48.

[2] Federal Emergency Management Agency (FEMA) Region X, *Cascadia Subduction Zone (CSZ) Catastrophic Earthquake and Tsunami Response Plan* (Washington, DC: U.S. Department of Homeland Security, 2013), 3.

likely to endure. Intense ground shaking, landslides, ground liquefaction, tsunamis, fires, hazardous material spills, and building damage are some of the hazards that will result.

This disaster would create unprecedented damage and potentially thousands of casualties in the Northwest.[3] Estimated impacts of a CSZ earthquake and resultant tsunami in the Northwest include mass fatalities into the tens of thousands, hundreds of thousands of destroyed or extensively damaged buildings, approximately $32 billion in economic losses, 27,600 displaced households and almost 1 million dump-truck loads of debris.[4] Highways and utility infrastructure are particularly vulnerable to widespread ground failure,[5] with timelines of critical infrastructure restoration ranging from three months to three years.[6]

Seaside has 83% of its population and 100% of its critical facilities in the tsunami inundation zone.[7] Making matters worse is the topography of the city, which is located less than 17 feet above sea level. If the earthquake indeed occurs as modeled, much of Seaside would simply be leveled and washed away, and many of its residents unable to reach high ground 1.5 miles away over damaged roadways and bridges.

With the incredible challenges of catastrophic natural disaster response and recovery, what geopolitical, physical, economic, social, and psychological factors contribute to the successful rebuilding or abandonment of a devastated city after a catastrophic disaster? Following this, by considering the identified factors, what are their impacts on the recovery of Seaside, Oregon, after a catastrophic 9.0 magnitude Cascadia Subduction Zone earthquake and tsunami?

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[3] Federal Emergency Management Agency (FEMA) Region X, *Cascadia Subduction Zone (CSZ) Catastrophic Earthquake and Tsunami Response Plan* (Washington, DC: U.S. Department of Homeland Security, 2013), 3.

[4] Oregon Seismic Safety Policy Advisory Commission, *The Oregon Resilience Plan—Cascadia: Oregon's Greatest Natural Threat*, 14.

[5] Ibid.

[6] Ibid.

[7] Ibid., 48.

The case study communities of L'Aquila, Italy; Watsonville, California; and Valdez, Alaska, following catastrophic earthquakes were selected to attempt to answer the research question. These communities have all faced significant earthquakes and faced differing challenges in recovery. The earthquakes in the selected communities occurred five years ago or longer to gauge the successes and failures of response and recovery actions. In exploring the communities' experience with earthquake recovery, several sources of information were analyzed including scientific journal articles, news reports, official government documents on the disaster, and economic analyses.

Through the study of the case studies' post-disaster actions, insights were gathered in challenges to reconstruction and recovery. Courses of action were determined that promote decisions benefitting disaster recovery and to avoid those decisions that hindered reconstruction in the studied communities.

Findings of the research were that abandonment was rejected by community actions in the case study communities, even in Valdez, which had to be moved from a precarious site. Survivors of disaster in those communities, despite their tragic losses, wanted to rebuild, and fought with the government in some cases to stay in their communities. For those survivors leaving the community, or denied the opportunity to participate in its reconstruction, psychological and social issues developed, which impacted the recovery.

The strongest and intertwined trend in the case study communities was the importance of land use planning in planning for, responding to, and recovering from disaster. Based on the case studies and learning from the challenges they faced post-disaster, the conclusion of this research is that land use planning, including the pre-event zoning and comprehensive planning of economic, residential, and industrial locations in a community, is critical to disaster response, resilience, and recovery. For areas subject to natural disaster, or other homeland security concerns, such as terrorism, land use planning should, pre-event, be more intimately interwoven, planning both for development and reconstruction following disaster with emergency management organizations dealing with response and recovery planning. Involvement of the public in

the design and implementation of recovery plans was also shown to be a primary catalyst for the successful emergence of communities from disaster.

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This work and the previous 18 months of my life are 100% dedicated to my foxy wife, Molly, and my boys, Alex and Gavin. Without their support and understanding, I would not have been able to finish this program. My wife is incredible for bearing the added challenges of raising two 4-year-olds with me being gone weeks at a time and involved in schoolwork when I was not in Monterey. To my little friends, Alex and Gavin, you both have been awesome in allowing me to focus on school at times and giving me a good excuse to ignore it when I needed to. I hope that this time in our lives made an impression on your future studies, understanding that it takes sacrifice at times for the ones you love. I love you all so much.

I would also like to formally thank my advisors Lauren and Rodrigo, who provided me with guidance and encouragement in completing this research. You both are a credit to the Center for Homeland Defense and Security (CHDS) for your dedication to helping students like me succeed. I am honored to have worked with you both.

Lastly, I would like to recognize the collaboration and friendships that I have shared with my comrades in cohorts 1301 and 1302. The education at CHDS is valuable; the partnerships and camaraderie that we as cohorts built are priceless. Thank you all for your contribution to this important milestone in my life.

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I. INTRODUCTION

A. BACKGROUND

Between 2010 and 2014, while employed as a planner for the Oregon Office of Emergency Management, I was the lead planner for the Cascadia Subduction Zone (CSZ) earthquake and tsunami response planning efforts. The project was led by Federal Emergency Management Agency (FEMA) Region X and involved close collaboration with the states of Washington and California, federal response partners, and city and county governments. The project involved many meetings and conversations with colleagues from all levels of government.

As the massive impact of a CSZ event was revealed, an ever-present hope or even assumption by some on the planning teams was that a mass evacuation of coastal areas (the hardest hit) would lessen the burden on response and recovery. This conversation occurred by planners in all phases of government, most surprisingly from local emergency managers wanting to force (albeit within legal guidelines) residents to abandon their homes so less of a support burden was put upon the limited resources in these coastal counties.

This line of thought was appealing to many (including myself) who were struggling to figure out ways of providing logistical support for survivors over the shattered roadways and bridges over the Oregon Coast Range as depicted in the event scenario and planning parameters. This line of thought was also equally appalling to many (also including myself) who saw it as an overreach of state and federal emergency powers and detrimental to long-term recovery. Basing important recovery planning on the immediate response actions (in this case, abandon their homes) can be a dangerous concept as communities look towards recovery. This danger is magnified when decisions on recovery from the disaster exclude the intentions of the survivors of this future catastrophe or research on what the involvement and intentions of survivors should be to ensure revival of their devastated lives and communities.

This research hopes to address the underlying impacts of catastrophic recovery faced by case study communities to determine smart practices, including the possibility of abandonment for the community of Seaside, Oregon, which is likely, based on the modeled scenario and planning parameters, to suffer extreme damage after a CSZ earthquake and tsunami.

B. RESEARCH QUESTION

With the incredible challenges of catastrophic natural disaster response and recovery, what geopolitical, physical, economic, social, and psychological factors contribute to the successful rebuilding or abandonment of a devastated city after a catastrophic disaster?

Following this question, by taking the identified factors into account, what are their impacts on the recovery of Seaside, Oregon, after a catastrophic 9.0 magnitude Cascadia Subduction Zone earthquake and tsunami?

Lastly, what is the likelihood and consequence of not rebuilding an American city after a catastrophic disaster?

C. PROBLEM STATEMENT

This study investigated examples of past catastrophic disasters and the positive and negative experiences as those communities struggled to return to normalcy.

"Should we continue to build there?" is a question asked after other past disasters' it is especially more poignant as local, state, and federal governments deal with pre-disaster mitigation funding and post-disaster emergency management funding issues. The goal of this research is to develop a way of answering that question through a better understanding of the social, economic, and cultural problems and opportunities of rebuilding. As a result of this line of study, shortcomings in the assumptions of existing response and recovery plans can be identified, and current community planning can consider future catastrophic events. Through pre-identification of physical, social and political limitations other communities have faced, proactive land use, response and

recovery-planning decisions could be implemented that increase the chance that communities can successfully emerge from disaster.

D. BACKGROUND

A known geologic hazard modeled to create incredible damage to the City of Seaside, Oregon, is the focus of this research because it is a matter of time that decisions on how, where, and most chilling, if, to rebuild will occur.

Of all Oregon coastal communities, Seaside has one of the most concentrated vulnerabilities to damage as a result of a CSZ earthquake and tsunami. Seaside has 83% of its population and 100% of its critical facilities in the tsunami inundation zone.[8] Making matters worse is the topography of the city; located less than 17 feet above sea level. If the earthquake indeed occurs as modeled, much of Seaside would simply be leveled and washed away, and many of its residents unable to reach high ground 1.5 miles away over damaged roadways and bridges.

The CSZ, located off the Northwest coast (Figures 1 and 2), is modeled to generate a 9.0 magnitude earthquake and a resulting tsunami up to 80 feet in height.[9] The devastating 2011 Tohoku earthquake and tsunami, being a geologically similar event, can provide some insight as to what damages the Northwest is likely to endure. Intense ground shaking, landslides, ground liquefaction, tsunamis, fires, hazardous material spills, and building damage are some of the hazards that will result. This disaster would create unprecedented damage and potentially thousands of casualties in the Northwest.[10] Estimated impacts of a CSZ earthquake and resultant tsunami in the Northwest include mass fatalities into the tens of thousands, hundreds of thousands of destroyed or extensively damaged buildings, approximately $32 billion in economic losses, 27,600

[8] Oregon Seismic Safety Policy Advisory Commission, *The Oregon Resilience Plan—Cascadia: Oregon's Greatest Natural Threat* (Salem, OR: State of Oregon, 2012), 48.

[9] Federal Emergency Management Agency (FEMA) Region X, *Cascadia Subduction Zone (CSZ) Catastrophic Earthquake and Tsunami Response Plan* (Washington, DC: U.S. Department of Homeland Security, 2013), 3.

[10] Ibid.

displaced households and almost 1 million dump truck loads of debris.[11] Highways and utility infrastructure are particularly vulnerable to widespread ground failure,[12] with timelines of critical infrastructure restoration ranging from three months to three years.[13]

Figure 1. Cascadia Subduction Zone Location Map[14]

[11] Oregon Seismic Safety Policy Advisory Commission, *The Oregon Resilience Plan—Cascadia: Oregon's Greatest Natural Threat*, 14.

[12] Ibid

[13] Ibid.

[14] Brian Romans, "Sea-Floor Sunday #20: Cascadia Subduction Zone," June 1, 2008, http://www.wired.com/2008/06/sea-floor-sunday-20-cascadia-subduction-zone/.

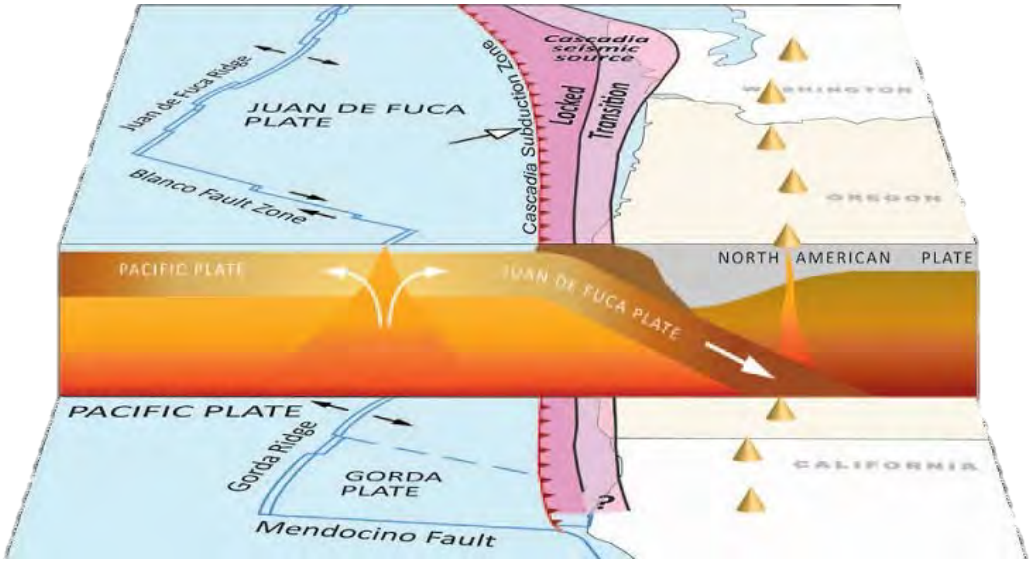

Figure 2. Cascadia Subduction Zone Cross Section Map[15]

This research hopes to expand the breadth of knowledge in homeland security by providing relevant, real world based analysis of past failures and successes in recovery and rebuilding of communities affected by disaster.

The federal preparedness metrics lists recovery as a key component of emergency response.[16] The research bridges gaps in knowledge of the multiple physical and social layers of recovery. The research question addresses recovery of a community after disaster by determining if the post-event conditions exist to sustain reclamation of the city. This research explores the response and mitigation of catastrophically devastated communities by examining past historical constructs and challenges to communities. Through the identification of past experiences leading to recovery or stagnation and abandonment, insight can be gained on the implementation of social, political, and land use actions to provide better options for catastrophically devastated communities.

[15] Celene Carillo, "Cascadia Roulette," January 25, 2011, http://oregonstate.edu/terra/2011/01/cascadia-roulette/.

[16] Federal Emergency Management Agency (FEMA) Region X, *Cascadia Subduction Zone (CSZ) Catastrophic Earthquake and Tsunami Response Plan*, 8–9.

E. RESEARCH DESIGN

1. Object of Study

The study is focused on the economic, sociological, psychological, historical, and political challenges of recovery and the ramifications of abandoning a city. Patterns of historical success or failure of other communities that faced catastrophic damages have been collected from wide variety of sources and sorted into the following five categories selected from findings that emerged in the literature review: economics of disaster recovery, natural barriers to recovery, land use and natural hazard planning recovery issues, social and psychological stresses of the loss of community, and geopolitical conflicts and the "sense" of place. The literature review categories vary slightly from the case study categories by excluding the physical and natural barriers to recovery; the reasoning being that the literature review covered a wide variety of disasters and war across many locations. Analyzing the impact on recovery from this large amount of terrain variability would have yielded uncertain conclusions.

2. Selection Criteria

Research used academic studies, government documents, and literature to provide qualitative analysis of the experiences of other communities that faced catastrophic disasters. "Catastrophic incident" is defined using the National Response Framework definition as "any natural or manmade incident, including terrorism, that results in extraordinary levels of mass casualties, damage, or disruption severely affecting the population, infrastructure, environment, economy, national morale, and/or government functions."[17] Historical examples were chosen based on similarity in disaster and scope to a CSZ earthquake in the Northwest. The communities and disasters to be studied include L'Aquila Italy following a 2009 earthquake, Watsonville, California, following a 1989 earthquake, and Valdez, Alaska, following the 1964 earthquake and tsunami. These communities were selected because all faced significant earthquakes and differing challenges in recovery. The earthquakes in all of these communities occurred five years

[17] Federal Emergency Management Agency, "National Response Frameworks-Frameworks Overview," accessed December 3, 2013, http://www.fema.gov/library/viewRecord.do?id=7361.

ago or later to gauge the successes and failures of response and recovery actions. In exploring the communities' experience with earthquake recovery, several sources of information were analyzed including scientific journal articles, news reports, official government documents on the disaster, and economic analyses.

3. Study Limitations

It is difficult to generalize the complex nature of catastrophic recovery in areas with differing economies, terrain, and capabilities. This study cannot address all aspects of post-disaster recovery. It is hoped future research could build upon these efforts.

In addition, due to research being conducted on society's geopolitical and cultural tendencies for recovery and reconstruction, a potential limitation of the research is the cultural and professional bias towards recovery of the literature reviewed. Some political, cultural, and geopolitical bias can be attributed to the American frontier and disaster response experience discussed in the literature review. Increased effort was taken by utilizing other established research of the case study communities to identify facts and commonalities of those communities' efforts in recovery, which allowed the use of these studies to analyze the case study communities geared towards the identified factors of this research. The establishment of commonalities in others' research and combining them with the identified study areas of the economics of disaster recovery, natural barriers to recovery, land use and natural hazard planning recovery issues, social and psychological stresses of the loss of community, and geopolitical conflicts and the "sense" of place allowed a uniform and ordered study of the recovery of the case study communities.

Abandonment following disaster was a challenging subject to research. Most instances of abandoning a city occurred following rapid and life threatening situations, such as Pripyat following the Chernobyl nuclear disaster. Abandonment was necessary for the residents' survival. City abandonment has occurred in authoritarian nations, but it was determined as not applicable to the federalist system in the United States. Failing to identify adequate case studies of abandonment following a natural disaster, a trend was

observed in the literature review showing a slow decline of impacted cities. This phenomenon was observed in two additional case studies.

4. Instrumentation

Information on the experiences of rebuilding communities was gathered from the literature review. Additional literature was reviewed on the social and psychological studies of catastrophe in general. The literature review was compiled showing several conflicting areas and unanswered concerns of the question “should we rebuild?” These conflicts arise in the economic, social, psychological, and geopolitical conflict realms of the review. By analyzing these factors and determining patterns, a greater knowledge of the multilayered facets of recovery after catastrophe has emerged. Research on real estate and economic development pressures is compiled from the historical examples and trends are compared to geographic information systems’ derived maps and spatial analysis of Seaside real estate and economic data. As a result, some insight has been gleaned on the potential pressure of the geopolitical conflicts from development. In addition to geopolitical conflicts, the study also review the role that a sense of place has in the community, and if the same passion for “place” exists post-catastrophe.

5. Steps of Analysis

Information gathered from each of the historical examples using each of the five categories developed during the literature review (economics, natural barriers, land use and natural hazard planning, social and psychological stresses of the loss of community and the sense of place geopolitical conflicts) to determine the overall success of recovery efforts from preparation for the disaster to the long-term sociological legacy of the event. These aspects were reviewed further to determine patterns of the effects of these factors on the sample communities studied. The results were applied to the City of Seaside (using government reports, scientific studies, CSZ response plans, land use planning studies, and demographic information) to determine the feasibility of a successful reconstruction following a devastating CSZ earthquake and tsunami.

The literature review identified components of the psychological and social component to a city’s recovery, as well as the geopolitical conflicts that develop because

of disaster. Analysis was conducted using a program effects case study approach to compare the historical catastrophic disaster events against each of the identified factors studied in the literature review. This research method determines the impact of programs and infers on reasons for success or failure.[18] A critical analysis of the extant literature has identified social, psychological, and political challenges, and solutions that the historical study cities faced in recovery. Using this approach, reasons for success or failure determined for the contributing factors can be extrapolated.

The end result of the case study is an overall picture on how the geopolitical, physical, economic, social, and psychological factors of different catastrophic events shape post-disaster recovery. The final step was to utilize the lessons learned from each case study to apply those findings into understanding the conflicting social factors of the likelihood of success in rebuilding Seaside following a catastrophic CSZ earthquake and tsunami. The policy implications of the identified historical studies were put against the current realities of Seaside's pre-CSZ preparations, planned response and recovery, and political, social, and geographical factors. Through comparison of other experiences, policy options can be made for decisions on rebuilding, pre-disaster "retreat" of the current city location to a safer location or the abandonment of Seaside based on the factors shown in the findings of the historical case studies.

F. CHAPTER OVERVIEW

Chapter II is a review of the extant literature on the economic, psychological, land use and physical restraints of recovery, social, and geopolitical aspects of abandoning a community. Due to the focus on recovery following a CSZ earthquake and tsunami in Oregon, a review of the literature surrounding recovery planning following disaster using Oregon's unique land use planning system was evaluated.

In Chapter III, case studies on communities (L'Aquila Italy, Watsonville California, and Valdez Alaska) who suffered severe earthquake damage are presented to

[18] Lynn Davey, "The Application of Case Study Evaluations," *Practical Assessment, Research & Evaluation* 2, no. 9 (1991), accessed July 9, 2014, http://PAREonline.net/getvn.asp?v=2&n=9.

determine how the geopolitical, physical, economic, social, and psychological factors of different catastrophic events shape post-disaster recovery in those cities.

Chapter IV places the findings associated with the case study communities into the context of a catastrophic CSZ earthquake and tsunami striking Seaside on the Oregon Coast.

Finally, in Chapter V, recovery practices and challenges faced in these communities are analyzed to determine what practices would best be suited to allow Seaside, Oregon, to recover from a modeled CSZ earthquake and tsunami, or if abandoning the community would be a viable and option in the aftermath.

II. LITERATURE REVIEW

A. BACKGROUND

The literature review was focused on the economic, sociological, psychological, historical, and political ramifications of abandoning a city. It was crafted using information collected from wide variety of sources and sorted into the following four categories.

- economics of disaster recovery
- Oregon coast-specific studies of land use and natural hazard planning and recovery issues
- social and psychological stresses of the loss of community
- geopolitical conflicts and a "sense" of place driving recovery

The literature review categories vary slightly from the case study categories by excluding the physical and natural barriers to recovery; the reasoning being that the literature review covered a wide variety of disasters and war across many locations. Analyzing the impact on recovery from this large amount of terrain variability would have yielded uncertain conclusions.

B. STUDIES OF ECONOMIC IMPACT AND ECONOMIC ASSISTANCE TO DISASTER-IMPACTED COMMUNITIES

The economic loss and rebuilding of communities is an important part of recovery post-disaster. Studies were analyzed to determine the effects of recovery funding on a disaster and determining how quickly and to what scale economic activity returned to the impacted area because of recovery activities.

The experiences in Alaska following the 1964 earthquake were of particular interest due to the similarities of the disaster event and isolation of communities there and in Oregon. "Windfalls of disaster" including the modernization of facilities and equipment, were described along with the incorporation of new ideas and innovations in

rebuilding a city and its economy.[19] Examples were given highlighting the City of Seward that utilized federal grants and cheap loans to rebuild and modernize its docks and railroad facilities.[20] In an interesting comparison, the study concluded that parallels existed with the Alaskan recovery and the economic consequences of a limited nuclear attack given the isolation and transportation difficulties in initiating recovery. These parallels led to an investigation into Cold War studies on the sociology and psychology of recovery following community devastation after a nuclear attack, which is covered later in the literature review. The 1964 Alaskan rebuilding experience was further summarized with the conclusion that through rebuilding stimulus, such as grants and loans, recovery and society as a whole become more efficient. An example was given of the state's fishing fleet, after rebuilding, repair and modernization became more productive than it was prior to the earthquake.[21] This argument has been backed up by 2004 research on post-disaster rebuilding in Brazil and South Africa.[22]

Other positive economic findings were found in the analysis of rebuilding after Hurricane Andrew in 1992. Rebuilding jobs created and investment in infrastructure following the 1994 Northridge earthquake were credited with pulling the Los Angeles economy out of recession.[23]

Greensburg, Kansas was a city devastated by an EF-5, 1.7-mile wide tornado, which severely damaged or destroyed *90*% of the town's structures. Post-event, the town has been rebuilt as a "100% renewable-powered city." The devastation of the town created a unique situation in which they could leverage federal funding and grants to pursue new infrastructure technology that would have been financially out of reach prior

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[19] Howard Kunreuther and Elissandra S. Fiore, *The Alaskan Earthquake—A Case Study in the Economics of Disaster* (Washington, DC: Institute for Defense Analyses, Economic and Political Studies Division, 1966), xvi.

[20] Ibid., 89–92.

[21] Ibid.

[22] Jesus Crespo Cuaresma, Jaroslava Hlouskova, and Michael Oersteiner, "Natural Disasters as Creative Desruction? Evidence From Developing Countries," *Economic Inquiry* 46, no. 2 (April 2008): 214–226.

[23] Drake Bennett, "How Disasters Help," *Boston.com*, last modified July 6, 2008, http://www.boston.com/bostonglobe/ideas/articles/2008/07/06/how_disasters_help/?page=full.

to the tornado.[24] Further research also echoed how disasters are beneficial to the economy, and an opportunity to improve the community these "benefits" were cited in several studies.[25]

Recent work shines doubts on the disaster creating economic growth as stated in the research listed above. This research has shown less growth in the short term and negligible effects on economic growth over a longer period of time. The main argument of Goldstein's research is that averaging growth over a long period of time overestimates the economic growth after a disaster.[26] Studies of large-scale disasters in Pakistan and in nations affected by the 2004 Indonesian tsunami showed that severe events severely impacted fragile economies in these nations.[27] The study had a caveat explaining that it was uncertain this situation would occur in a nation like the United States, which is capable of providing greater post-event assistance.

It is interesting that the Hurricane Sandy Rebuilding Strategy contains many references to rebuilding and resilience. It touches on the relocation of properties, but makes it clear that increasing flood insurance premiums may cause those who lack the fiscal resources to make less resilient mitigation decisions.[28] This uncertainty of funding, and the increased insurance premiums that homeowners will face, make Hurricane Sandy Rebuilding Recommendation 54 ("*Encourage increased hazard mitigation activities in order to protect property against future losses*") difficult to implement for communities

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[24] Shanti Pless, Lynn Billman, and Daniel Wallach, "From Tragedy to Triumph: Rebuilding Greensburg, Kansas to be a 100% Renewable Energy City," *American Council for an Energy-Efficient Economy Summer Study* (2010): 2–19.

[25] Kevin Rozario, "Rising from the Ruins," *Wall Street Journal*, last modified January 16, 2010, http://online.wsj.com/article/SB10001424052748703657604575005211595984220.html; Amy Glasmeier, interview by Peter Dizikes, "3 Questions: Amy Glasmeier on Rebuilding After Disaster Hits," *MIT News Office*, June 1, 2011, http://newsoffice.mit.edu/2011/3q-glasmeier-rebuilding-0601; Bruce Evan Goldstein, "Skunkworks in the Embers of the Cedar Fire: Enhancing Resilience in the Aftermath of Disaster," *Human Ecology* 36, no. 1 (2008): 15–28.

[26] Eduardo A. Cavallo, Sebastian Galiani, Ilan Noy, and Juan Pantano, *Catastrophic Natural Disasters and Economic Growth* (Washington, DC: Inter-American Development Bank, 2010), 30.

[27] Richard Bryant, "Managing the Psychological Effects of Natural Disasters," *Phys.org*, last modified March 31, 2011, http://phys.org/news/2011-03-psychological-effects-natural-disasters.html.

[28] Hurricane Sandy Rebuilding Task Force, *Hurricane Sandy Rebuilding Strategy* (Washington, DC: U.S. Department of Housing and Urban Development, 2013), 124–128.

seeking increased resilience to disaster.[29] The strategy continues to report that of the population living in 100-year flood plain zones, 41.4% are low to median income.[30] This finding is problematic based on research that the poor were far less likely to recover and are more likely to relocate after a catastrophic disaster.[31] This thesis reviews the demographics and poverty of Seaside to determine impacts in recovery.

Oddly, and unfortunately for Seaside, it was found that post-disaster growth was greater with frequent climatic disasters, such as hurricanes, than with earthquakes in less disaster prone areas.[32] Oregon has few disasters compared to other states.[33]

C. OREGON COAST-SPECIFIC STUDIES OF LAND USE AND NATURAL HAZARD MITIGATION PLANNING

Oregon has a unique land-use planning program that adds legal and environmental complexity to the issue of rebuilding or gradually moving a community out of hazard areas. To determine the potential challenges of recovery, it was imperative to study the benefits and challenges of these regulations to land use planning post-disaster.

The Oregon Natural Hazard Workgroup conducted a case study of the City of Cannon Beach (8.9 miles south of Seaside) with the goal of preparing coastal communities for recovery post-earthquake and tsunami. Recommendations from this work included a review of zoning rules to streamline development approval, the identification of post-disaster land uses for coastal communities, and establishment of recovery ordinances to streamline the redevelopment process.[34] Furthering this line of study, research recommended ways of increasing emergency management planning and

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[29] Hurricane Sandy Rebuilding Task Force, *Hurricane Sandy Rebuilding Strategy*, 124–128.

[30] Ibid.

[31] Rozario, "Rising from the Ruins"; Glasmeier, interview by Peter Dizikes, "3 Questions: Amy Glasmeier on Rebuilding After Disaster Hits."

[32] Mark Skidmore, and Hideki Toya, "Do Natural Disasters Promote Long-Run Growth?," *Economic Inquiry* 40, no. 4 (2002): 664–687.

[33] New York Times, "Where to Live to Avoid a Natural Disaster," last modified April 30, 2011, http://www.nytimes.com/interactive/2011/05/01/weekinreview/01safe.html.

[34] Oregon Natural Hazards Workgroup, *Cannon Beach Case Study Report-Cannon Beach Post-Disaster Recovery Planning Forum* (Eugene. OR: Oregon Natural Hazards Workgroup, 2006), 1–5.

increased resiliency on the Oregon Coast.[35] These actions require cooperation from county planning departments and the state land-use planning agency, the Department of Land Conservation and Development, to adjust the statewide planning system to meet this need (it currently has no emergency land-use planning criteria established). Identification of the pre-disaster steps to achieve this need for the City of Seaside would be useful further research.

An interesting conclusion came out of Yamashita's study of Tohoku after the earthquake and tsunami of 2011. He found that the centralization of Japanese government and society has contributed to the slow pace of restoration. Small communities are unable to act quickly and autonomously to disaster.[36] Parallels to this centralization can perhaps be tied to the centralized statewide planning system in Oregon. Additionally, concerns have developed in emergency planning that the state land use program has no emergency provisions identified to allow for temporary incompatible zoning uses or post-tsunami redevelopment. Thus, far, the literature researched identifies this issue, but have not presented a solution.

D. SOCIAL AND PSYCHOLOGICAL STRESSES OF CATASTROPHIC DISASTER

Research gathered showed community desire and ability to rebuild in the face of immense devastation and loss. Through comparison, parallels may be drawn with future catastrophic events, and mitigation to overcome identified challenges addressed.

The Chernobyl accident in 1986 forced the evacuation and resettlement of 134,000 people in the Soviet states of Ukraine, Belarus, and Russia. Resettlement was traumatic with evacuees feeling distressed by their hasty resettlement and the instant destruction of their society.[37] Society identified the evacuees as "sufferers," and as "victims," further degrading the mental health of evacuees, leading them to think of

[35] Jennifer E. Pearce, "Catastrophic Post-disaster Long-term Recovery Planning-A Capacity and Needs Assessment of the Oregon Coast" (graduate terminal project, University of Oregon, 2008), 39–52.

[36] Yusuke Yamashita, "How Does the Restoration of Tohoku Society Begin? Center and Periphery in the Great East Japan Earthquake," *International Journal of Japanese Sociology* 21 (2012): 1172–1179.

[37] International Atomic Energy Agency, *Chernobyl's Legacy: Health, Environmental and Socio-economic Impacts* (Vienna, Austria: IAEA Division of Public Information, 2005), 21.

themselves as victims and helpless, weak, and lacking control over their future.[38] These findings were studied in a natural disaster setting with a study of the mental health of evacuees from Hurricane Katrina. In Mortensen, Wilson and Ho's study, Katrina evacuees reported nervousness, restlessness, worthlessness, hopelessness, and spells of terror or panic at least a few times a week.[39] With the potential almost total loss of their community, it is plausible that the survivors of Seaside would have similar feelings after a CSZ earthquake and tsunami.

Cold War studies on the population's potential psychological and social problems after nuclear war had differing results. Crisis relocation was deemed as an acceptable practice (for both evacuees and host areas) in a 1975 study.[40] Survivors of Hiroshima and Nagasaki appeared to have "no debilitating block to their participation in long-term recovery efforts."[41] In contrast, a more recent analysis on Nagasaki survivors' mental health showed increased apathy, relationship problems, and enjoyment of life.[42]

The experiences of Pattonsburg, Missouri[43] and Galveston, Texas[44] showed that often when communities rebuild, they do not return to their former size and influence. This situation is attributed to "bifurcation," when existing systems breakdown, some communities (and their social structures) return to equilibrium, while others falter or cease to exist.[45] Pattonsburg exists today, smaller, and moved from its former location,

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[38] International Atomic Energy Agency, *Chernobyl's Legacy: Health, Environmental and Socio-economic Impacts*, 21.

[39] Karoline Mortensen, Rick K. Wilson, and Vivian Ho, "Physical and Mental Health Status of Hurricane Katrina Evacuees in Houston in 2005 and 2006," *Journal of Health Care for the Poor and Underserved* 20, no. 2 (2009): 524–538.

[40] Jiri Nehnevajsa, *Crisis Relocation: Perspectives of Americans* (Washington, DC: Defense Civil Preparedness Agency, 1975), 32.

[41] Irving L. Janis, *Air War and Emotional Stress: Psychological Studies of Bombing and Civilian Defense* (New York, NY: McGraw-Hill, 1951), 37–38.

[42] Yasuyuki Ohta et al., "Psychological Effect of the Nagasaki Atomic Bombing on Survivors after Half a Century," *Psychiatry and Clinical Neurosciences* 54, no. 1 (2000): 97–103.

[43] Steven M. Schnell and Gregory Haddock, "Pattonsburg Is Dead, Long Live Pattonsburg! Sense of Place in the Face of Disaster," *Middle States Geographer* 37 (2004): 100–107.

[44] Brent Hales, Norman Walzer, and James Calvin, "Community Responses to Disasters: A Foundation for Recovery," *Community Development* 43, no. 5 (2012): 540–549.

[45] Hales, Walzer, and Calvin, "Community Responses to Disasters: A Foundation for Recovery," 540–549.

but it is not the same in the eyes of its residents.[46] This change is attributed to the disruption of life and loss of community that accompanies catastrophe.[47] The study identified three steps that need to occur to maintain equilibrium and maximize stabilization and recovery.

- effective planning
- effective communication of risk
- preparing a community with the resources to meet their needs[48]

This conclusion bodes well for Seaside due to the Oregon Coast being aware of the risk, producing and expanding planning to deal with the event, and having an active citizenry focused on preparedness.[49]

Beichan, China was listed as an example of a city abandoned after a disaster, where a devastating 2008 earthquake leveled the city that killed 50,000. Epecuen, Argentina was also left behind after a catastrophic dam break in 1985.[50] More detailed studies on the sociology and psychology of these communities would be useful to compare to the previously discussed sociological and psychological research. It should be stressed that the powerful central governments of China and Argentina at the time would likely institute a response unlike the federalist United States.

A hopeful end to this portion of the literature review came from a study on planning for post-disaster reconstruction with children. It was suggested that being involved in the reconstruction process is "a precious opportunity" for children and adult

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[46] Schnell and Haddock, "Pattonsburg Is Dead, Long Live Pattonsburg! Sense of Place in the Face of Disaster," 100–107.

[47] Rob Gordon, "The Social System As Site of Disaster Impact and Resource for Recovery," *Australian Journal of Emergency Management* 19, no. 4 (2004): 16–22.

[48] Hales, Walzer, and Calvin, "Community Responses to Disasters: A Foundation for Recovery," 540–549.

[49] Federal Emergency Management Agency, "Citizen Corps," accessed March 10, 2014, https://www.citizencorps.fema.gov/cc/searchCouncil.do?submitByZip.

[50] Jaweed Kaleem, "After Oklahoma Tornado, To Rebuild or Not Rebuild," *Huffington Post*, last modified May 21, 2013, http://www.huffingtonpost.com/2013/05/21/oklahoma-tornado-rebuilding_n_3315029.html.

survivors to take control of their shattered communities and to begin healing.[51] This final finding added to the mixed results of this portion of the literature review, with no clear pattern on social and psychological stresses of disaster factoring in on the desire to rebuild.

E. GEOPOLITICAL CONFLICTS AND THE "SENSE" OF PLACE

Sections of this literature review have alluded to an "anthropological necessity" of rebuilding. The geopolitical "politics of belonging" were analyzed to look into conflicts and power rivalries as land use plans try to place limits on development in hazard areas in conflict with human desire to be close to beautiful scenery. A look into the conflicts of rational hazard development (safety, protecting investment, etc.) vs. the sensual gratification of living in a dangerous but beautiful area was studied.

Rebuilding American cities is "attributed to a mixture of economics, politics, nationalism and spiritual views that often sets the U.S. apart from other nations."[52] Research in this area is important, and may serve as an underlying cause of this nation's "need" to rebuild after devastation. Geopolitics is the study of power rivalries over territories.[53] Important concepts include both natural and geologic information, and the demographics, and sociology of a people interacting in a zone of contact between two entities or social systems.[54]

Modern society espouses the belief that humans dominate the world and through ingenuity, are unlimited in their potential to change it to meet its needs. In reality, as seen in natural disasters, this country is quite limited based on natural resources, topography, geology, and other natural forces.[55] Geopolitical analysis of the United States explained

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[51] Sheridan Bartlett, *Making Space for Children—Planning for Post-disaster reconstruction with Children and Their Families* (Chennai, India: Save The Children—Tsunami Rehabilitation Programme, 2007).

[52] Kaleem, "After Oklahoma Tornado, To Rebuild or Not Rebuild."

[53] Yves Lacoste, *Géopolitique: La Longue Histoire d'aujourd'hui* (Paris: Larousse, 2008).

[54] Graham Evans and Jeffrey Newnham, *The Penguin Dictionary of International Relations* (London: Penguin Books, 1998), 18.

[55] Geoffrey Parker, *Geopolitics: Past, Present and Future* (London: Pinter, 1998), 14; Harold Sprout and Margaret Sprout, *Toward a Politics of the Planet Earth* (New York, NY: D. Van Nostrand Company, 1971), 293.

that belief in manifest destiny, and with it, ever expanding wealth and security had given a sense of greatness to American society. It was argued that America *believes* it succeeded due to strength rather than the natural resource bounty provided by the continent.[56] Further, American success was driven by low cost of land compared to other nations, an adaptable and more easily redefined workforce based on frontier society, and financial resources, rather than central national planning.[57] American optimism that life will be better, the historical experience of taming a continent and changing the world might explain why reconstruction of hazard prone areas occurs.[58] A worrisome observation was made that America appears to be losing its resiliency with poor emergency planning and challenges of aging infrastructure. Flynn's analysis ends with "It is foolish to go right back to the business as usual as soon as the dust clears."[59]

Geopolitical conflicts in land use arise between development, seeking to fulfill the demand of those wanting an ocean view of Pacific sunsets, and land use planning requiring limitations on the development of natural hazard areas. The Oregon Coast is a popular destination for retirement and resettlement of people leaving urban areas for the quiet beauty of the coast. This conflict is described in the works of Mann and Jeanneaux who discuss conflict from the urbanizing pressures of residential development.[60] Conflicts between development, resources (to include natural hazard area exclusion from development), and property rights have been described as a triangle with each component not allowing for complete fulfillment of the other components.[61] These geopolitical conflicts will shape the pre- and post-disaster landscape by affecting the potential

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[56] Stratfor Analysis. *The Geopolitics of the United States, Part 2: American Identity and the Threats of Tomorrow* (Austin, TX: Stratfor Global Intelligence, 2011), http://www.stratfor.com/sample/analysis/geopolitics-united-states-part-2-american-identity-and-threats-tomorrow.

[57] Ibid.

[58] Stephen E. Flynn, "America the Resilient: Defying Terrorism and Mitigating Natural Disasters," *Foreign Affairs* (March/April 2008): 2–8.

[59] Ibid.

[60] Carsten Mann and Philippe Jenneaux, "Two Approaches for Understanding Land-Use Conflict to Improve Rural Planning and Management," *Journal of Rural and Community Development* 4, no. 1 (2009): 118–141.

[61] David R. Godschalk, "Land Use Planning Challenges-Coping with Conflicts in Visions," *Journal of the American Planning Association* 70, no. 1 (2004): 5–13.

physical, economic, and social impact of a catastrophic disaster. The flip side of the development conflict is the sense of place and desirability of living on the coast. Studies have shown the effect of "place" on lakefront property extending beyond property owners' own homes. The greater value that a property owner puts on the lake (the environment), the greater the affinity and mental worth their properties had in the property owner's view.[62] With this sense of attachment for property, research is challenged to find connections between this affinity and a sense of potential post-disaster tribalism,[63] in which the sense of place of landowner conflicts with responders not from the disaster area moving them off their property and imposing restrictive land use and development standards limiting their reconstruction.

An "anthropological necessity" exists of bringing life back to an empty town and restoring the pre-disaster social order.[64] Echoes of this line of thought appeared throughout the literature reviewed. The tendency to rebuild in America is a "mixture of economics, politics, nationalism and spiritual views," which promotes a sense of resilience, renewal, and improvement to the destruction.[65]

Research on evacuee attachment to the home community from the 1953 flooding in Holland showed that evacuees forced from their homes wanted to return as quickly as possible. Evacuees associated mostly with fellow evacuees, and did not fit into the host community.[66] This research was backed by studies of survivors in Cassino and Nagasaki preferring to return to the damaged community rather than be evacuated.[67] Centralia, Pennsylvania was mostly evacuated after an underground coal seam fire in 1962 led to

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[62] Bradley S. Jorgenson and Richard C. Stedman, "A Comparative Analysis of Predictors of Sense of Place Dimensions: Attachment to, Dependence on, and Identification with Lakeshore Properties," *Journal of Environmental Management* 79, no. 3 (November 2005): 316–327.

[63] Yves Lacoste, "Rivalries for Territory," *Geopolitics* 5, no. 2 (2007): 120–158.

[64] Maxim Alexandrovich Kudryashov, "Urban Abandonments: An Anthropological View."*Second International Conference of Young Urban Researchers,* Lisbon, Portugal, October 11–14, 2011 (Lisbon: Centro de Investigação e Estudos de Sociologia (CIES-IUL), Instituto Universitário de Lisboa (ISCTE-IUL), 2011), 7.

[65] Kaleem, "After Oklahoma Tornado, to Rebuild or Not Rebuild."

[66] Cornelis Jacobus Lammers, *Survey of Evacuation Problems and Disaster Experiences, Studies in Holland flood disaster 1953. Volume 2* (Charlottesville, VA: National Research Council, 1955), 35.

[67] Charles E. Fritz and J.H. Mathewson, *Convergence Behavior in Disasters—A Problem in Social Control* (Washington, DC: National Academy of Sciences National Research Council, 1957), 33–34.

safety concerns. The dozen or so remaining residents of Centralia continue to maintain their homes, lawns, and the town cemetery simply because they identify Centralia as "home."[68]

The most tragic literature reviewed was a 1976 study on the people of Buffalo Creek Hollow, West Virginia who suffered a flood of coal slurry that devastated the area in 1972. Interviews were centered on the loss of neighborhoods, and a sense of place.[69] The shock and horror of communal loss abounds in his work. Relatable text to this literature view includes "one is very apt to feel adrift…." and "A world without stable points of reference is a world in ruins."[70] One aspect of Erikson's work was fact that the numbers of victims of the disaster were more than non-victims.[71] It was found that "disasters do not generally have disabling emotional consequences or leave numbing mental health problems among any large numbers of their victims."[72] They suggest that victims are out-numbered by non-victims in this situation, which allows for a re-absorption of victims into the community. Seaside would face a similar fate, with those affected by the disaster outnumbering non-victims, which may affect the type and speed of reconstruction, or even the will to do so.

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68 Associated Press, "After 50 Years, Fires Still Burns Underneath PA Town.," *USA Today*, last modified May 26, 2012, http://usatoday30.usatoday.com/news/nation/story/2012-05-25/fire-still-burns-in-centralia/55213824/1.

69 Kai T. Erikson, *Everything in It's Path: Destruction of Community in the Buffalo Creek Flood* (New York, NY: Simon and Schuster, 1976), 14.

70 Ibid., 257.

71 Ibid.

72 Enrico L. Quarantelli, and Russel R Dynes, *Images of Disaster Behavior: Myths and Consequences*, (Columbus. OH: The Ohio State University, Disaster Research Center, 1973), 17.

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III. CASE STUDY DATA COLLECTION AND ANALYSIS

A. HISTORICAL CATASTROPHIC DISASTER CASE STUDY #1—THE L'AQUILA, ITALY, EARTHQUAKE OF 2009

1. Background

A 6.3 magnitude earthquake occurred in the Abruzzo region of Italy (depicted in Figure 3) on April 6, 2009 that severely impacted the capital of the region, the city of L'Aquila, located approximately 90 minutes east of Rome. Several strong aftershocks added to the destruction. As a result of the earthquake, 308 persons were killed and over 1,500 injured. The center of the city was entirely destroyed and much of the town infrastructure (including university buildings of newer, supposedly more stringent building materials). The event displaced over 67,000 people with 44,000 people left homeless as a result of the event. Approximately 100,000 buildings were severely damaged or destroyed. Survivors were forced into temporary tent communities set up near their destroyed homes, or relocated to hotels away from the impacted area.[73]

[73] David E. Alexander, "Mortality and Morbidity Risk in the L'Aquila, Italy, Earthquake of 6 April 2009 and Lessons to Be Learned," In *Advances in Natural and Technological Hazards Research*, ed. Robin S. Spense and E. Ho (Berlin: Springer, 2011), ch. 13, 185–197.

Figure 3. Location Map of L'Aquila, Italy[74]

The Italian government immediately dispatched large amounts of rescue, humanitarian, and military support to the region. Without the infusion of outside resources, the event's impact to the citizens of Abruzzo would have been much more severe. The Italian military was credited with re-establishing the capabilities of the severely damaged trauma center and evacuating seriously injured citizens to outside of the region.[75] By all accounts studied, the coordination and implementation of the response to the disaster was impressive. Within days, Italian Civil Authorities had deployed 12,000 rescue and relief workers from across the country and the European Union.[76]

In the days following the initial rescue operations, due to debris and safety concerns, most of L'Aquila's downtown (as depicted in Figures 4 and 5) was cordoned off and declared "Zona Rossa" ("Red Zone"). Residents were allowed only limited (or in

[74] Created by author using Bing Maps online map tool.

[75] David E. Alexander, "The L'Aquila Earthquake of 6 April 2009 and Italian Government Policy of Disaster Response," *Journal of Natural Resources Policy Research* 2, no. 4 (2010): 325–342.

[76] Natural Environment Research Council (U.K.), "L'Aquila Earthquake—A Year On," last modified June 28, 2010, http://planetearth.nerc.ac.uk/features/story.aspx?id=753.

many cases, none at all) access to their damaged homes.[77] As of 2013, the area is still mostly off limits, as described by Baldini, "On balconies and in windows of uninhabited homes, washing still hangs from some lines. It is only when you look closely that you see it is faded and twisted around the string from being exposed to the elements over the past four years."[78] This vivid image of the long-empty and restricted downtown of L'Aquila results from economic, planning, geopolitical, and social issues as described further in this case study.

Figure 4. L'Aquila, Italy, City Center Earthquake Damage[79]

[77] Alexander, "The L'Aquila Earthquake of 6 April 2009 and Italian Government Policy of Disaster Response," 325–342.

[78] Luisa Baldini. "L'Aquila After the Earthquake: Why Flags Do Not Fly," *BBC*, last modified June 25, 2013, http://www.bbc.co.uk/news/world-europe-22986058.

[79] *Wall Street Journal*, "Quake Devastates L'Aquila," April 6, 2009, http://online.wsj.com/news/articles/SB123900072556892085.

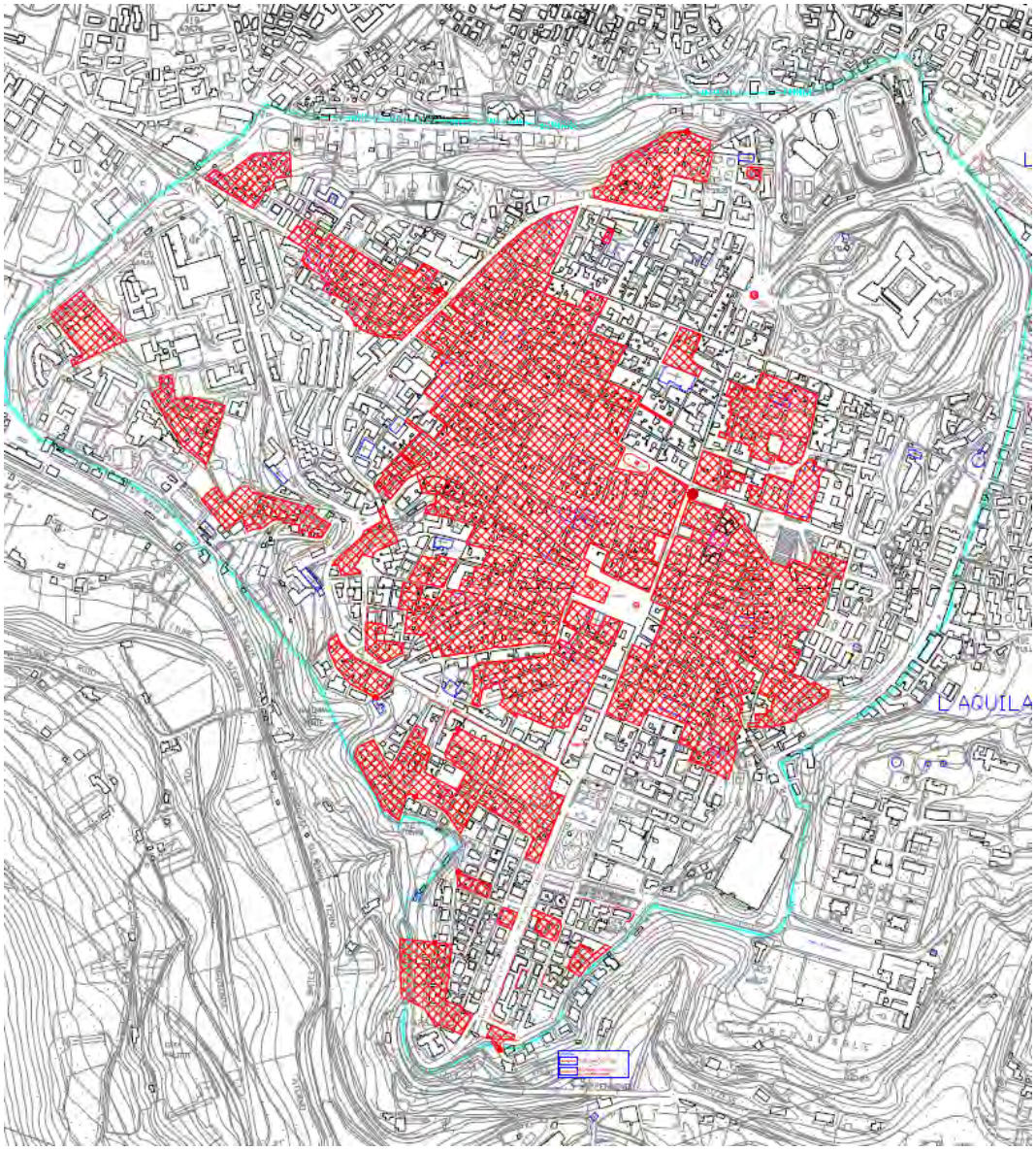

Figure 5. L'Aquila, Italy, "Zona Rossa" Restricted Areas 2011[80]

Studies comparing American and Italian disaster response showed that both nations responded quickly and decisively to the disasters. Another positive for both nations was the involvement of volunteers in response and recovery. The areas in which the United States and Italy differed were that surveys showed that Americans were better

[80] Corrado Mastropietro, *L'Aquila, Cartografia della Zona Rossa—6aprile.it,* April 19, 2011, http://www.6aprile.it/documenti/2011/04/19/l%E2%80%99aquila-cartografia-della-zona-rossa.html.

aware of recovery options while Italians had a far less understanding that led to delays in recovery.[81] This study was confirmed by the events in L'Aquila.

2. Data and General Analysis

a. Economic Impacts and Financial Support for Recovery

The earthquake has been estimated to have cost Italy an estimated €4 billion Euros in economic losses.[82]

The initial success of the response to the earthquake gave a vision of control of the disaster to Italians and the global community. The reality was that the momentum of the national government response, erosion of local control, and exclusion of local interests slowed recovery.[83] The historic center of L'Aquila is still unoccupied, with recovery efforts in the red zone not proceeding beyond the stabilization of damaged buildings and removal of *some* rubble. According to Cassachia et al., the residents of the city center "despair of ever returning" to their homes and businesses.[84]

Responsibilities for reconstruction were handled over to the Abruzzo regional government but funding for recovery was nationally controlled.[85] This governmental disconnect has led to additional delays in reconstruction. Studying the vulnerability of concrete structures, Liel and Lynch found that one year after the earthquake, only 23% of buildings outside of the city center were being repaired.[86] The city center has had a much more difficult time in recovery as it is governed by different ordinances and has been

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[81] Fausto Marincioni, "A Cross-Cultural Analysis of Natural Disaster Response: The Northwest Italy Floods of 1994 Compared to the U.S. Midwest Floods of 1993," *International Journal of Mass Emergencies and Disasters* 19, no. 2 (2001): 209–239.

[82] Anna Longhini, *The L'Aquila Earthquake: Assessing the EU and Italian Intervention*: *Proceedings of the EU Policies for Disaster Prevention, Relief and Post-Disaster Reconstruction Workshop*, Johannes Gutenberg Universität, Mainz Germany, March 11–16, 2013 (Mainz: European Consortium for Political Research, 2013), 1–18.

[83] Massimo Casacchia, Rocco Pollice, and Rita Roncone, "The Narrative Epidemiology of L'Aquila 2009 Earthquake," *Journal of Epidemiology and Psychiatric Sciences* 21, no. 1 (March 2012): 13–21.

[84] Ibid.

[85] Alexander, "The L'Aquila Earthquake of 6 April 2009 and Italian Government Policy of Disaster Response," 325–342.

[86] Abbie B. Liel and Kathryn P. Lynch, "Vulnerability of Reinforced Concrete Frame Buildings and Their Occupants in the 2009 L'Aquila Earthquake," *Natural Hazard Review* 13, no. 1 (2012): 1–16.

cordoned off for years.[87] In 2010, only about half of residents were still trying to determine how and if they would be able to rebuild.[88]

Damage to the city center has exacerbated an economy dealing with high unemployment and recession prior to the earthquake.[89] It was estimated that 26,000 were unemployed because of the earthquake. The initial boom in construction work failed to translate into an expansion of the general revitalization of the economy. The L'Aquila experience followed the boom and bust model described in the research of Haas et al.,[90] which caused economic stagnation and an outmigration of workers to areas with better job outlooks.[91] L'Aquila suffered a 66% loss of local tax revenue following the earthquake.[92] This funding loss and stalled infrastructure repairs that has deterred businesses from returning has created a vicious cycle of cause and effect from which L'Aquila is struggling to break out. L'Aquila has yet to recover fully from the earthquake with the per capita GDP is now around 80% of the national average and below the regional average.[93]

Housing reconstruction has been primarily focused on new housing projects located outside of the city. Rather than temporary housing, such as trailers used in the United States while reconstruction occurs, Italian authorities decided to construct permanent housing complexes known as the Complessi Antisismici Sostenibili ed Ecocompatibili[94] (CASE) project.[95] The CASE project consists of 185 buildings with a

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[87] Alexander, "The L'Aquila Earthquake of 6 April 2009 and Italian Government Policy of Disaster Response," 325–342.

[88] Ibid.

[89] Ibid.

[90] J. Eugene Haas, Robert W. Kates, and Martyn J. Bowden, *Reconstruction Following Disaster* (Cambridge, MA: MIT Press, 1977).

[91] David Alexander, "Models of Social Vulnerability to Disasters," *Revista Crítica de Ciências Sociais* 4, no. 4 (2012), http://rccsar.revues.org/412.

[92] David Alexander, "An Evaluation of Medium-Term Recovery Processes After the 6 April 2009 Earthquake in L'Aquila, Central Italy," *Environmental Hazards* 12, no. 1 (2013): 60–73.

[93] Alexander, "The L'Aquila Earthquake of 6 April 2009 and Italian Government Policy of Disaster Response," 325–342.

[94] English translation—anti-seismic, sustainable and environmentally friendly structures.

[95] Liel and Lynch, "Vulnerability of Reinforced Concrete Frame Buildings and Their Occupants in the 2009 L'Aquila Earthquake," 1–16.

total of 4,600 fully furnished and initially rent-free apartment located around the city. The project is capable of housing 15,000 residents. The buildings were not intended for survivors to live in indefinitely; eventually, the reconstruction plans call for them to be reused as dormitories as the university expands.[96] CASE construction was completed in 2010 with approximately $1.4 billion dollars U.S. being dedicated to the project. The problem with CASE is that the project did not consider local needs or reconstruction plans when it was created.[97]

L'Aquila's recovery became a platform in Italian elections. Promises made by Prime Minister Silvio Berlusconi of free housing for survivors won needed votes in Abruzzo, but also extended the dependency on federal recovery efforts. Alexander noted, "the more substantial, integral, and comfortable one makes the temporary housing, the less incentive there is to reconstruct permanent accommodation. Moreover, the neglect of the economy and infrastructure failed to kick-start any indigenous form of recovery."[98]

The Italian government continued to play a primary role in the preliminary recovery and reconstruction of the region, and excluded local involvement.[99] This approach was heavily apparent in the implementation of the CASE project. While the national approach provided assistance and resources to L'Aquila, it also added friction between local and federal governments and an additional layer of complexity to recovery.[100]

b. Natural Barriers to Recovery

Central Italy has a long history of earthquakes. Part of L'Aquila is in an area that geologically magnifies seismic effects. Since the 14th century, the town has been hit by

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[96] G. M. Calvi and V. Spaziante, "Reconstruction Between Temporary and Definitive: The CASE Project," *Progettazione Sismica* 21, no. 1 (2009): 221–250.

[97] Longhini, *The L'Aquila Earthquake: Assessing the EU and Italian Intervention*: *proceedings of the EU Policies for Disaster Prevention, Relief and Post-Disaster Reconstruction Workshop*, 1–18.

[98] Alexander, "The L'Aquila Earthquake of 6 April 2009 and Italian Government Policy of Disaster Response," 325–342.

[99] Alexander, "Mortality and Morbidity Risk in the L'Aquila, Italy, Earthquake of 6 April 2009 and Lessons to Be Learned," 185–197.

[100] Ibid.

eight major earthquake events. On February 2, 1703, the region, and the city of L'Aquila, suffered a tremendous (estimated at 6.9 magnitude) earthquake killing an estimated 10,000 people and destroying much of the city.[101] An earthquake struck the region (but not affecting the city of L'Aquila) in 1915. This event also caused severe casualties (killing 32,000 people, including 10,700 [94% of the population]) in the town of Avezzano, 50 km south of L'Aquila. Smaller earthquakes have occurred frequently, and the populous prepared for such events; however, the intensity of the event in April 2009 is rare.[102]

A physical obstacle to recovery was the topography adding to the dispersal of the population. A third found short-term shelter in tents or with family away from the event and the rest found shelter in hotels. Most of the hotels were located at Adriatic Sea resorts, a long distance from L'Aquila and separated from the Gran Sasso Mountain, the highest in Central Italy. The geography of the area may have given a sense of separation from L'Aquila that would not have been as apparent in flatter terrain. The dispersed population sheltered a long distance from their homes has been shown to result in a sense of abandonment and disorientation in adults due to the loss of community.[103] The distance from home has had less of an impact on children due to the artificial social structure of schools and routine established in the evacuation areas.[104]

c. Land Use and Mitigation Planning Recovery Issues

As previously described, the main focus of recovery housing was the CASE project, despite prefabricated structures being donated that would allow residents to be closer to their homes and neighborhoods. Survivors lived in tents and hotels for almost

[101] Paulo F. Galli, Fabrizio Galadini, and F. Calzoni, "Surface Faulting in Norcia (Central Italy): A Paleoseismological Perspective," *Tectonophysics* 403, no. 1–4 (2005): 117–130.

[102] Manuela Farinosi and Emiliano Trere, "Inside the "People of the Wheelbarrows:" Participation Between Online and Offline Dimension in the Post-quake Social Movement," *The Journal of Community Informatics* 6, no. 3 (2010), http://ci-journal.net/index.php/ciej/article/view/761/639.

[103] Alexander, "An Evaluation of Medium-Term Recovery Processes After the 6 April 2009 Earthquake in L'Aquila, Central Italy," 60–73.

[104] Ibid.

seven months before being resettled in the CASE apartments.[105] The decision to forgo temporary housing is understandable, with remnants of temporary housing and prefabricated homes located in Messina, Avezzano, and in Western Sicily following earthquakes in 1908, 1915 and 1968, respectively.[106]

On a positive note, the complexes were seismically sound and built with quality materials. Residents, who had little, were given all the basic necessities for a home including cookware and bed linens to enable a temporary home to be reestablished.[107] The CASE project went to great lengths and costs on landscaping and creating communal areas in the complexes.[108] This effort, while respectful of some survivors' needs for community, has failed by not including the community in its design. It has been noted by Alexander regarding the closure and abandonment of the city center after the earthquake that "It's not clear how much (of the historical communal places and structure) of this can be recovered. At worst the closure might represent a form of forced migration."[109]

Despite these successes, other key land use planning considerations were ignored or not completed. All the CASE complexes were constructed on environmental conservation lands outside of the city. These transitional areas did not have the infrastructure to support such development with some of the CASE structures poorly designed sanitary systems discharging raw sewage directly into the river.[110]

Another design flaw of the CASE project was the fact that the complexes were located away from amenities, away from the city center, and distant from their devastated

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[105] Calvi and Spaziante, "Reconstruction Between Temporary and Definitive: The CASE Project," 221–250.

[106] Alexander, "The L'Aquila Earthquake of 6 April 2009 and Italian Government Policy of Disaster Response," 325–342.

[107] Calvi, and Spaziante, "Reconstruction Between Temporary and Definitive: The CASE Project," 221–250.

[108] Alexander, "An Evaluation of Medium-Term Recovery Processes After the 6 April 2009 Earthquake in L'Aquila, Central Italy," 60–73.

[109] Ibid.

[110] Alexander, "The L'Aquila Earthquake of 6 April 2009 and Italian Government Policy of Disaster Response," 325–342.

homes.[111] Only one of the CASE project sites was located in the city of L'Aquila. Some are located up to 15–16 km (between 9 and 10 miles) away from the city. The CASE projects serve up to 2,500 people but the structures have limited services, such as shopping and limited public transportation to access commercial areas, medical facilities, or government services elsewhere.[112]

Reconstruction in the city center was extremely limited until 2012. Recovery was focused on the construction of the CASE project homes and other controversial housing projects built on the outskirts of the city.[113] Civic structures were left in ruins while outside reconstruction plans, fueled by reconstruction monies, called for the construction of a large-scale shopping mall and underground parking lot under the Cathedral and piazza. This lack of concern for civic structures and necessities for reconstruction greatly angered residents who were still living in transitional housing[114] and opposed to new construction outside of the city center.

Local and national leaders had the belief that the rebuilding of homes was the primary importance of the recovery efforts. As the recovery dragged on, interviews with those local leaders still spoke about recovery of individual housing, but their comments also echoed the frustration of survivors that the CASE project and temporary reconstruction (such as stabilization efforts) have been happening at a much higher rate than the reconstruction of homes.[115] Other complaints had arisen regarding the complexity and confusion on construction standards and planning requirements. Conflict and confusion also occurred due to the prioritization of repairs and perceived favoritism in the absence of a comprehensive reconstruction plan.[116] Despite the issues of a lack of a

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111 Alexander, "The L'Aquila Earthquake of 6 April 2009 and Italian Government Policy of Disaster Response," 325–342.

112 Alexander, "An Evaluation of Medium-Term Recovery Processes After the 6 April 2009 Earthquake in L'Aquila, Central Italy," 60–73.

113 Ermanno Rivetti, "L'Aquila Staggers Towards Recovery on Fourth Anniversary of Quake," *The Art Newspaper*, last modified April 1, 2013, http://www.theartnewspaper.com/articles/LAquila+staggers+towards+recovery+on+fourth+anniversary+of+quake/29280.

114 Ibid.

115 Alexander, "The L'Aquila Earthquake of 6 April 2009 and Italian Government Policy of Disaster Response," 325–342.

116 Ibid.

comprehensive recovery plan, schools, hospitals and government buildings for the most part were rebuilt with priority to show that, as an interviewee of Alexander put it, "life goes on."[117] Still, L'Aquila's leaders stated that some schools were not repaired because as one put it, he "does not see a future for the youth."[118] The concern of local and national leaders regarding the reconstruction was that significant delay occurred in the speed of the reconstruction of critical buildings (such as police stations).[119] Direr in their view was that limited attention was paid to the reconstruction of cultural and historic landmarks, and a complete lack of concern for the establishment of "productive business activities," and commercial and industrial structures, which they saw as critical for long-term recovery.[120]

Italy's regional risk reduction policies appear inadequate. Below the regional governments, only a small number of Italian municipalities have comprehensive disaster reduction (mitigation) plans.[121]

d. The Social and Psychological Stresses of the Loss of Community

Italian emergency response and recovery is handled primarily through The Civil Protection Department (Dipartimento della Protezione Civile). In times of disaster, the structure and governance of the department calls for a system of control consisting of local, regional, and national responses. Officially, local leadership plays the primary role, but the ability of local governments to respond is variable across the nation, and some municipalities may cede control of the response to the Italian government. Recovery efforts are handled on a case-by-case basis, which can impact the amount of post-disaster funding dramatically.[122]

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[117] Alexander, "The L'Aquila Earthquake of 6 April 2009 and Italian Government Policy of Disaster Response," 325–342.

[118] Ibid.

[119] Abbie B. Liel et al., "Perceptions of Decision-Making Roles and Priorities Affecting Rebuilding After Disaster: the Example of L'Aquila, Italy," *Earthquake Spectra* 29, no. 3 (2013): 843–868.

[120] Ibid.

[121] Alexander, "An Evaluation of Medium-Term Recovery Processes After the 6 April 2009 Earthquake in L'Aquila, Central Italy," 60–73.

[122] Alexander, "Mortality and Morbidity Risk in the L'Aquila, Italy, Earthquake of 6 April 2009 and Lessons to Be Learned," 185–197.

Prior to the earthquake, Prime Minister Silvio Berlusconi's administration sought to strengthen and expand the role of the Italian government in disaster response.[123] In the chaos of the L'Aquila response, The Department of Civil Protection assumed much of the response decisions including the order to evacuate L'Aquila and the early recovery work, which set into motion a system in which local decisions were ignored, and L'Aquila's citizen concerns and needs overlooked.[124] The primary failure in Italian planning, management, and execution for emergencies has been observed to be the coordination with local and regional governments. Overly complex regulations and guidelines also have hampered disaster response and recovery. This tension between local and federal governments only increased, as a major federal response was needed in the L'Aquila recovery.[125]

The involvement of the local populace in recovery and restoration of their community was very limited. This lack of involvement not only led to friction between federal emergency managers and the public, but also failed to capitalize on the "precious opportunity" for children and adult survivors to take control of their shattered communities and to begin healing as described by Bartlett.[126] Other studies of the healthy aspects of rebuilding after trauma have found that communities can create new opportunities and innovation in rebuilding, greater compassion towards each other, personal strength to recover emotionally, a fuller appreciation of life, and a greater spiritual life and understanding.[127] The failure of the L'Aquila response and recovery to use local efforts as a leading force, amplified with external assistance, led to the

[123] Alexander, "Mortality and Morbidity Risk in the L'Aquila, Italy, Earthquake of 6 April 2009 and Lessons to Be Learned," 185–197.

[124] Alexander, "The L'Aquila Earthquake of 6 April 2009 and Italian Government Policy of Disaster Response," 325–342.

[125] Ibid.

[126] Bartlett, *Making Space For Children—Planning for Post-Disaster Reconstruction with Children and Their Families*.

[127] Lawrence G. Calhoun and Richard G. Tedeschi, *The Handbook of Posttraumatic Growth: Research and Practice* (Mahwah, NJ: Lawrence Erlbaum Associates, 2006).

described recovery challenges and a sense that survivors had no control over their plight.[128]

Homeless survivors temporarily housed in camps were made to feel as if their plight is overstated as Prime Minister Silvio Berlusconi caused a controversy when he said, in an interview that L'Aquila's survivors should consider their situation like a "camping weekend"—"They have everything they need, they have medical care, hot food... Of course, their current lodgings are a bit temporary. But they should see it like a weekend of camping."[129]

High levels of psychological distress were found in 65.6% of the residents studied.[130] In the transitional shelter that followed the hotel and tent phase, domestic violence, substance abuse, and other social pathologies increased significantly.[131] In the transitional housing developments, other social and psychological consequences resulted directly from the lack of attention to social structure and networks.

Residents had an enhanced sense of "isolation, abandonment and powerlessness."[132] Women, the unemployed, and elderly were particularly at risk of high levels of post-traumatic stress, anxiety, and depression.[133] Immigrants also felt discrimination as the degradation of social structure gave rise to the belief that non-Italians benefitted the most in the reconstruction and re-assignment of housing.[134] As discussed in the natural barriers to recovery section of the L'Aquila research, evacuated

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[128] Vicki Bier, "*Hurricane Katrina as a Bureaucratic Nightmare*," in *On Risk and Disaster: Lessons from Hurricane Katrina*, ed. Robert J. Daniels, Donald F. Kettl, and Howard Kunreuther (Philadelphia, PA: University of Pennsylvania Press, 2006), 243–254.

[129] John Hooper, "Berlusconi: Italy Earthquake Victims Should View Experience As Camping Weekend,"*The Guardian.com*, last modified April 8, 2009, http://www.theguardian.com/world/2009/apr/08/italy-earthquake-berlusconi.

[130] Casacchia, Pollice, and Roncone, "The Narrative Epidemiology of L'Aquila 2009 Earthquake," 13–21.

[131] Camillan Task Force, "Studio Rainbow: Storia Naturale dei Disturbi da Stress Postraumatico (PTSD) Nei Bambini Abruzzesi Esposti al Terremoto Dell'aprile 2009" (manuscript, Camillan Task Force, Rome, Italy, 2010).

[132] Alexander, "An Evaluation of Medium-Term Recovery Processes After the 6 April 2009 Earthquake in L'Aquila, Central Italy," 60–73.

[133] Ibid.

[134] Ibid.

populations suffered from a sense of abandonment after prolonged separation from their homes. Children fared slightly better in relocated areas with a sense of routine and structure, such as school attendance.[135]

e. The Geopolitical and Sociological Need of the Case Study Community to Rebuild

As researched, the rebuilding of L'Aquila was very much mishandled by the Italian government. It does not appear that intentional permanent abandonment was considered by the Italian government, but its mishandling of the situation seemed to have given L'Aquila's residents that impression. The outsider, national government response was unable to act quickly and decisively in the reconstruction. This inability of the federal government to meet the needs of the local population adequately was highlighted in a study on Hurricane Katrina. Bier asserts, "Entities charged with recovery management are typically bureaucratic structures and, therefore, may be further inhibited by their rigidity, inefficiency, and functional apathy."[136]

Much of the geopolitical conflict stemmed from the conflict of survivors, whose opinions were excluded and reconstruction efforts led by outsiders and the federal government. This conflict was set afire by the April 6, 2009, 3:34 PM phone call between entrepreneur Pierfrancesco Gagliardi and his brother-in-law Francesco De Vito Piscicelli, former technical Director of the Office of Public Procurement and Environment in Rome. This conversation was taken from part of the wiretapping presented during the investigation set up by an Italian prosecutor.[137]

> Stay on this earthquake thing because we have to start full throttle, there's not an earthquake everyday." I know (laughing).
>
> God forbid, poor people. Vabbuò.—(*what does it matter*)

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[135] Alexander, "An Evaluation of Medium-Term Recovery Processes After the 6 April 2009 Earthquake in L'Aquila, Central Italy," 60–73.

[136] Bier, "*Hurricane Katrina as a Bureaucratic Nightmare*," 243–254.

[137] Longhini, *The L'Aquila Earthquake: Assessing the EU and Italian Intervention*: *proceedings of the EU Policies for Disaster Prevention, Relief and Post-Disaster Reconstruction Workshop*, 1–18.

> This morning at 3.30 AM, I was laughing in the bed.—*The earthquake struck L'Aquila at 3:32 AM*
>
> Me too.

This corruption of outside officials and contractors defines the conflict of outside influences and the needs of locals. The wiretap conversation contrasts heavily with a comment by a citizen protester—"Any given Sunday we are here shoveling, we are with our wheelbarrows"[138]

Utilizing Facebook, citizen protests against the lack of accessibility to their damaged homes were organized. On February 21, 2010, the "Protesta delle 1,000 chiavi" ("1,000 keys protest") was the first local protest against conflicts that have arisen from the mishandling of the recovery of L'Aquila. Protesters hung house keys on the barricades that prevented their access to the downtown.[139]

Protests intensified in reaction to the impression that the government and media were trying to present the response and recovery as a success and miracle. A week after the first protest, 6,000 citizens took it upon themselves to resist authority and remove debris from the damaged downtown.[140] The protests spread virally on social media and the group "Coordinamento Carriole Aquilane" (Aquilan wheelbarrows coordination) was founded by university student, Federico D'Orazio. The goals of the coordination group were to address the mismanagement of the reconstruction. Its purpose was to the following.

- to involve citizens in decision processes regarding L'Aquila reconstruction, ending the top down approach to reconstruction (or the lack thereof)
- to promote transparency in the management of the disaster funds
- to reopen the red zone
- to sensitize public opinion about the issue of the debris removal and the consequent historical center reconstruction

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[138] Farinosi and Trere, "Inside the "People of the Wheelbarrows:: Participation Between Online and Offline Dimension in the Post-quake Social Movement."

[139] Ibid.

[140] Ibid.

As a result of the lack of participation of locals, and the absence of progress on reopening the city center, and leadership of the recovery by outside interests, on July 6, 2010, a number of L'Aquila's citizens peacefully marched on Rome where their protests were violently stopped by police.[141]

The geopolitical conflicts of L'Aquila's citizens vs. outside federal forces and funding could be analyzed as a desire to reestablish their lives on their own accord. L'Aquila is their home, and their inability to mold its future after the earthquake was likely seen as an invasion of their sense of place. The slow nature of the recovery and disconnect of the populace in its planning intensified the conflict.[142] A subsequent occupation of the city park reclaimed shared public spaces for L'Aquila's citizens,[143] and in organizing against an outside foe, L'Aquila reestablished a sense of place and community described by Castells as a "new connectedness around shared, reconstructed identity."[144] With the loss of L'Aquila's sense of place due to the destruction of their homes and public places, increased by the community's lack of participation in reconstructing new ones, the conflict was viewed as necessary to reclaim the sense of place.[145]

Mayor Massimo Cialente took on the federal government when he accused it of forgetting and betraying L'Aquila's reconstruction. Capitalizing on the wheelbarrow movement, he resigned his symbolic mayoral sash and refused to fly the Italian flag on buildings in the city. Ironically, he was forced to resign on January 12, 2014 due to a corruption and fraud scandal regarding the reconstruction corruption and bribery. In his

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[141] Farinosi, and Trere, "Inside the "People of the Wheelbarrows": Participation Between Online and Offline Dimension in the Post-quake Social Movement."

[142] Cinzia Padovani, "Citizens Communication and the 2009 G8 Summit in L'Aquila, Italy," *International Journal of Communication* 4 (2010): 416–439.

[143] Ibid.

[144] Manuel Castells, *The Rise of the Networked Society: The Information Age: Economy, Society and Culture* (Oxford: Blackwell Publishers, 1996), 23.

[145] Padovani, "Citizens Communication and the 2009 G8 Summit in L'Aquila, Italy," 416–439.

resignation statement, the mayor said he had "no legitimacy left," and "I am no longer useful in this town"[146]

Local taxes and mortgages were still collected on destroyed homes. L'Aquila's citizens suffered further perceived conflict from outsiders when the Italian government's moratorium on federal taxes expired in 2010. The Italian government demanded that all taxes be collected and repaid after that time period; only through public protest has the time period for repayment been extended to 10 years.[147]

L'Aquila's struggle against outside influence on the recovery of their community was indicative of the internal Italian geopolitical conflict that assisted the corruption of reconstruction and continued federal paternalism of Italian politics.[148] The protests have attracted attention to the struggles of L'Aquila's recovery; however, there may not be enough momentum and outrage at the L'Aquila experience to overcome centuries of historical overreach by Rome.[149]

f. Summary

L'Aquila suffered from a failure of local regional and national governments to plan and involve local citizens in the execution of reconstruction in the aftermath of the event. This failure led to economic impacts that continue to the present day. The dispersal of the population due to the topography and government policies exacerbated the pace of recovery. Elementary land use planning concepts, such as involving public stakeholders in development, was ignored, along with the protection of environmentally sensitive areas and providing essential amenities to residential developments. The remaining local population felt their needs were ignored at best, openly ridiculed by Rome at its worst. Not being involved in reconstruction took its toll on the population's social and

[146] BBC News Europe, "Fraud Scandal Forces L'Aquila Mayor to Quit," last modified January 12, 2014. http://www.bbc.co.uk/news/world-europe-25702891.

[147] Alexander, "The L'Aquila Earthquake of 6 April 2009 and Italian Government Policy of Disaster Response," 325–342.

[148] Alexander, "An Evaluation of Medium-Term Recovery Processes After the 6 April 2009 Earthquake in L'Aquila, Central Italy," 60–73.

[149] Ibid.

psychological health. Lastly, all these factors fanned the geopolitical conflict and sense by locals of "us vs. them," outside forces not concerned with the local population intentionally adding to the suffering and humiliation of L'Aquila.

B. HISTORICAL CATASTROPHIC DISASTER CASE STUDY #2—WATSONVILLE, CALIFORNIA'S RECOVERY FROM THE LOMA PRIETA EARTHQUAKE OF 1989

1. Background

The City of Watsonville, California, (see location map in Figure 6) was severely impacted by the 1989 Loma Pietra earthquake. The 7.1 magnitude earthquake, the largest on the San Andreas Fault since 1906,[150] struck the San Francisco Bay area, which shaked violently for 15 seconds. Damage was severe. Portions of the Bay Bridge and freeways were damaged with the City of Watsonville being severely damaged. Strict seismic building code restrictions proved effective in keeping casualties low; the event killed 63 people in total, across the bay area.[151]

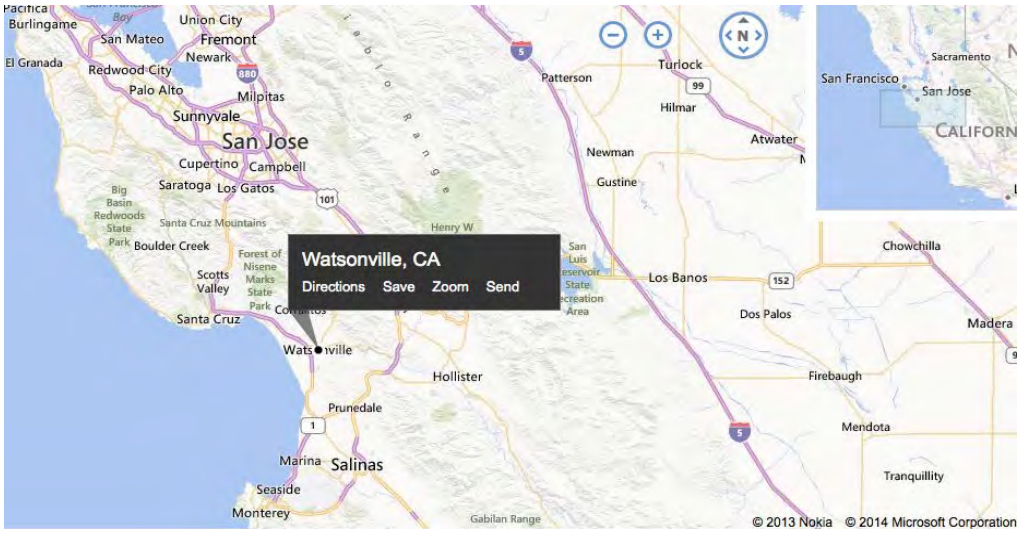

Figure 6. Location Map of Watsonville California[152]

[150] George Plafker and John P. Galloway, *Lessons Learned from the Loma Prieta, California, Earthquake of October 17, 1989* (Washington, DC: United States Geological Survey, 1989), 1.

[151] Ibid.

[152] Created by author using Bing Maps online map tool.

The greatest impact to Watsonville was both the loss of over 10% of its housing (800 homes) and approximately 50% of its commercial buildings after being destroyed or severely damaged from the event.[153] Across the city, thousands needed shelter and mass care support.

2. Data and General Analysis

a. Economic Impacts and Financial Support for Recovery

Richard Wilson, City Manager of Santa Cruz, described the vulnerability of a local economy based off his experience: "A disaster does not fundamentally change the larger economy; it simply takes out the most vulnerable parts of the pre-disaster economy, the economic trends that were in place before the disaster will continue. The major change will be that the economic activities lost in the disaster will be resumed elsewhere."[154]

The recovery of Watsonville dramatically changed the economic situation in the city. To recover successfully, Watsonville needed to create new components and new partnerships. Economic recovery took a primary role in post-disaster recovery.[155] It was, however, slowed throughout the Bay Area because of the California recession and local economic problems, which added issues to a slow and uneven recovery process.[156] Twenty years after the earthquake in Watsonville, commercial development lags in the downtown area and agricultural businesses have closed. Much of these trends were already occurring prior to the earthquake; the Loma Prieta earthquake increased the

[153] Vic Lee, "Watsonville Left in Shambles by 1989 Quake," *KGO-TV, San Franscisco*, last modified October 17, 2009, http://abc7news.com/archive/7048993.

[154] Richard C. Wilson, *The Loma Prieta Quake, What One City Learned* (Washington, DC: International City Management Association, 1991).

[155] Natural Hazards Center, *Holistic Disaster Recovery Ideas for Building Local Sustainability after a Natural Disaster* (Boulder, CO: University of Colorado, Boulder, 2005), 5–18.

[156] Charles C. Eadie, "Earthquake Case Study: Loma Prieta in Santa Cruz and Watsonville, California," in *Planning for Post-Disaster Recovery and Reconstruction*, ed. Jim Schwab (Washington, DC: FEMA/American Planning Association, 1988), 281–310.

pattern. Since 1989, job losses have impacted the local economy with 22.4% unemployment and a foreclosure rate nearly a third higher than the rest of California.[157]

Regional economic recovery through The Association of Bay Area Governments (ABAG) strove to tackle economic recovery holistically by "encouraging open discussion on the resolution of racial/ethnic problems in all aspects of community life, including housing and employment. This should be a broad-based effort involving schools, lenders, business and civic organizations, religious and community organizations, and the real estate community."[158] These efforts paid dividends in Watsonville by using federal loan programs to advocate for training low-skilled workers and investing in residential reconstruction efforts.[159] Secondary benefits of this approach, given the low-income Spanish-speaking population of Watsonville, are evident in the sociological challenges of recovery.

Low-income economic issues were evident in temporary shelter assistance by the American Red Cross and FEMA. Due to the large number of low-income rental tenants in Watsonville, compounded by the inability to prove residency, vulnerable low-income renters in Watsonville faced conflict and economic hardships. FEMA and the Red Cross provided up to 18 months of rental assistance for homeowners until they could rebuild their homes, and two months' rental assistance for renters. Low-income and non-English speaking residents unable to prove residency were given assistance as FEMA and the Red Cross accepted vouchers from church and community leaders along with other non-traditional proof of residency to accommodate the population better, and to ease conflict. The chief lesson of this approach was that it was a better situation to accommodate these people rather than to continue mass care sheltering.[160]

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[157] Kevin Fagan, "A Tale of 2 Cities 20 Years after Loma Prieta," *SF Gate*, last modified October 11, 2009, http://www.sfgate.com/bayarea/article/A-tale-of-2-cities-20-years-after-Loma-Prieta-3283951.php#page-1.

[158] Natural Hazards Center, *Holistic Disaster Recovery Ideas for Building Local Sustainability after a Natural Disaster*, 6–8.

[159] Ibid.

[160] Mary C. Comiero, *Housing Repair and Reconstruction After Loma Prieta* (Berkeley, CA: University of California, Berkeley, 1997), http://nisee.berkeley.edu/loma_prieta/comerio.html.

Watsonville was estimated to have lost close to $200,000 ($308,647.86 in 2013 dollars) in sales tax revenue.[161] This money was recovered by a six-year, ½-cent countywide sales tax measure in 1990 that was put entirely toward earthquake recovery. Passage of this measure was useful because it could be used towards reconstruction based entirely on local needs, unlike outside grants that had greater restrictions on their use.[162] This tax measure was fully supported by the chamber of commerce and generated approximately $15 million ($23,148,589.66 in 2013 dollars**)** for the city.[163]

By 1992, 90% of residential damage had been repaired; the combination of new and repaired housing projects had resulted in no net loss of housing by 1994. Due to demand, Watsonville still faces housing needs.[164] It took longer than a decade to repair damage from the earthquake. As identified in Lee's report for KGO-TV in 2009, Assistant City Manager Marcela Tavantzis declared that downtown Watsonville has never been the same. "Some things that were lost were never recaptured."[165]

b. Natural Barriers to Recovery

Watsonville has no significant natural or topographic barriers to recovery compared to the other case study communities. The economy and demographics of Watsonville were, however, a barrier that limited the ability of residents to recover and impeded the movement of assistance. These factors are identified in other segments of this study.

Pre-event land use policies created an artificial barrier to recovery, as pre-disaster zoning geared to limit growth and protect farmland created difficulties in finding sites for temporary FEMA trailers. The city did not want to place them on commercially zoned properties out of fear of inhibiting economic recovery. Sites for only 85 trailers were

[161] Conversions of past dollar values to 2013 dollars were completed using the Areppim Calculator at http://stats.areppim.com/calc/calc_usdlrxdeflator.php.

[162] Eadie, "Earthquake Case Study: Loma Prieta in Santa Cruz and Watsonville, California," 281–310.

[163] Ibid.

[164] Ibid.

[165] Lee, "Watsonville Left in Shambles by 1989 Quake."

found on publicly owned, and church owned properties.[166] This situation created an immediate need for housing. In Watsonville, this problem was addressed in the short term by streamlining planning procedures and suspending non-conforming use requirements.[167] Property owners were also encouraged to add housing units through construction of cottage units on lots previously zoned for only one single-family dwelling. Long-term housing construction was augmented through increasing housing densities and annexation of new properties that could meet housing demands.[168]

c. Land Use and Mitigation Planning Recovery Issues

Prior to the earthquake, Watsonville had seismic safety codes and planning ordinances identifying existing hazard vulnerabilities and methods to mitigate structures against earthquake damage. The post-disaster recovery-planning component was not included in either land use or emergency management plans.[169]

As a result of the earthquake, Watsonville has developed a community-based disaster recovery plan based on the lessons learned from challenges after the Loma Prieta earthquake.[170]

A decade-later comparison of the reconstruction of the city of Los Gatos (immediately south of San Jose) and Watsonville by Rodriguez and Jones in 2009 identified two different approaches to recovery by the cities. Los Gatos, a wealthier community in danger of losing its historic character, took an approach of instituting slow growth and historic preservation policies to save the character of the city. The end result a decade later was that the community rebounded well, and now has some of the priciest real estate in the area due to its unique historical character.[171]

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[166] Eadie, "Earthquake Case Study: Loma Prieta in Santa Cruz and Watsonville, California," 281–310.

[167] Ibid.

[168] Ibid.

[169] Ibid.

[170] Eadie, "Earthquake Case Study: Loma Prieta in Santa Cruz and Watsonville, California," 281–310.

[171] Joe Rodriguez and Donna Jones, "Watsonville, Los Gatos Take Divergent Paths to Earthquake Recovery," *Inside Bay Area*, last modified October 8, 2009, http://www.insidebayarea.com/ci_13439576.

Watsonville took an approach different from Los Gatos. Watsonville leaders realized, before the quake that community change was necessary; the earthquake hastened the need for a downtown renewal. The focus of Watsonville's reconstruction was on transforming the downtown to a government and educational center as its focus with the hope that small businesses drawn to the increased downtown activity would follow.[172] The strategy was marginally successful, 16 damaged buildings were replaced and historical buildings were demolished.

After the closing of the Ford's department store, a big perceived loss to Watsonville's downtown, economic recovery in Watsonville was helped after another retailer, Gottschalks,[173] moved into the newly vacant store. The city played an active role in securing a tenant for the large downtown store through low interest loans. Another positive downtown development activity by the city was to rehabilitate a building on the downtown plaza and lease it to a community college campus.[174] Significant federal and state economic assistance was needed to rebuild the community. Watsonville's experience was that recovery plan development should identify all possible funding opportunities to be able to capitalize on them quickly after the event.[175]

In the aftermath, Watsonville sought to repair and regain its historic character of its downtown. Public projects, such as the retrofit of the old post office (which became the community college campus), parking structures, and upgrades to local schools all utilized urban design that matched the historic character of the community.[176]

Economic issues in Watsonville's downtown recovery were impacted by the ups and downs of the regional economy. Pedestrian traffic and retail activity increased but fell sharply with the 2008 recession. The resiliency of local business owners was apparent, as Rodriguez and Jones spoke with downtown Ace Hardware owner Manuel

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[172] Ibid.

[173] The Watsonville Gottschalks closed in 2009, as a result of corporate issues.

[174] Eadie, "Earthquake Case Study: Loma Prieta in Santa Cruz and Watsonville, California," 281–310.

[175] Eadie, "Earthquake Case Study: Loma Prieta in Santa Cruz and Watsonville, California," 281–310.

[176] Ibid.

Rodrigues, he declared, “Watsonville is a working community, not your glitzy Los Gatos type of community,” he said. “But downtown Watsonville has held its own.”[177]

Damages to housing the earthquake were concentrated in downtown residential areas. Prior to the earthquake, these areas already faced housing shortages and overcrowding.[178] The earthquake provided an opportunity to address these issues and promote social equity through ordinances requiring that 25% of housing repaired and created after the earthquake is affordable to lower income households. This strategy increased the available affordable housing in the city.[179]

In reconstruction and replacement of damaged housing, very few Watsonville residences applied or received state and federal assistance in rebuilding.[180] Despite this situation, within one year after the disaster, 75% of homes were repaired or replaced. City officials anticipated that many in the community would not qualify for assistance and created an alternative to federal and state support. By leveraging public and corporate donations along with Red Cross disaster assistance, the city created a fund that provided small grants ($20,000–$40,000) for disaster assistance to citizens for reconstruction efforts.[181] The speed of residential reconstruction was hastened by the city’s decision to streamline building permits and approvals. The city took an “easy on permits and tough on inspections” strategy to expedite reconstruction and ensure that it was being done safely.[182] The manager of a firm that provided repair and reconstruction permitting services to Santa Cruz County described the benefit of identifying what form these permitting actions will take pre-event. From the National Research Council’s Practical Lessons from the Loma Prieta Earthquake, “Governments should focus on and formalize the process they want to have in place when disaster strikes rather than trying to reinvent

[177] Rodriguez and Jones, “Watsonville, Los Gatos Take Divergent Paths to Earthquake Recovery.”

[178] Natural Hazards Center, *Holistic Disaster Recovery Ideas for Building Local Sustainability after a Natural Disaster*, 5–18.

[179] Ibid.

[180] Comiero, *Housing Repair and Reconstruction After Loma Prieta*.

[181] Comiero, *Housing Repair and Reconstruction After Loma Prieta*.

[182] Ibid.

or tweak or get around or ignore normal procedures when you're trying to move as quickly as possible to help your community."[183]

Even more than pre-planning for permitting, communities affected by the Loma Prieta Earthquake suffered from a lack of overall recovery planning. Much of the post-disaster decisions were made without pre-planned guidance. It was noted in the journal *Earthquake Spectra* that "The lack of recovery planning in all jurisdictions is glaringly obvious. There are no preplanned programs, and all decisions appear ad hoc and characterized by linear thinking rather than systematic approaches."[184] Another issue with changes to land-use code occurred when Santa Cruz County, in which Watsonville is located, began to implement strict building codes in landslide prone areas after the earthquake.[185] New technical data gave precedence and practical safety reasons to implement these actions, but implementing them after the disaster, effectively limited the population's ability to rebuild, which inflamed tensions as people were trying to recover. The conflict was finally settled with landowners taking all responsibility for future losses to rebuild.[186] State support in establishing rebuilding regulations along with financial assistance was identified as solutions to solving this issue.[187]

As identified by the National Research Council, pre-event recovery planning needs to occur to address the following parameters identified in a study following Loma Prieta.

- Well in advance of an earthquake, local jurisdictions need to establish overall programs for handling the recovery and rebuilding that occur.
- The organizational structure needed to guide intensive rebuilding efforts needs to be defined and the rules for its operation established. Options

[183] National Research Council, *Practical Lessons From the Loma Prieta Earthquake* (Washington, DC: National Academy Press, 1994), 222.

[184] Lee Benuska, ed. "Loma Prieta Earthquake Reconnaissance Report," *Earthquake Spectra* 6, supp, (May 1990): 1–448.

[185] National Research Council, *Practical Lessons From the Loma Prieta Earthquake*, 222.

[186] Joanne Nigg, ed., *The Loma Prieta, California, Earthquake of October 17, 1989—Recovery, Mitigation, and Reconstruction*, *Professional Paper 1553-D* (Washington, DC: United States Government Printing Office, 1998).

[187] National Research Council, *Practical Lessons From the Loma Prieta Earthquake*, 222.

seem to include the elected body itself, a committee, or possibly. a redevelopment agency.

- Ordinances need to be prepared that will become effective automatically upon declaration by the governing body of the jurisdiction. These ordinances should cover a range of topics, some of which may include:
  - Applications deemed routine should be exempted from time-consuming reviews and normal fees.
  - Permission should be given to use recreation vehicles, campers, etc., for normal living for short periods.
  - Provisions should be established for temporary use of non-commercial buildings by displaced businesses.
  - Provisions should be made on how to handle repair and rebuilding in areas that experience ground failure.
- Plans for organizational structure and procedures to be followed after an earthquake needs to consider that unforeseen controversy might arise.
- As an assist in developing the organization and procedures to respond to an earthquake, earthquake scenarios might be used to help understand the various problems with which they will be confronted.
- Arrangements should be made to obtain additional personnel and expertise to handle the large increase in applications for repairing and replacing structures.[188]

Encouraging these pre-event planning decisions and protocols with citizen involvement using modeled earthquake impacts could limit post-disaster confusion and conflict as recovery begins.

d. The Social and Psychological Stresses of the Loss of Community

Approximately 60% of the population affected by the Loma Pietra earthquake was Spanish-speaking immigrants from Mexico and Central America of lower income.[189] This lower income is problematic for rebuilding based on research that the poor were far less likely to recover from a catastrophic disaster and more likely to relocate.[190] Low-

[188] Ibid.

[189] Alice Fothergill, Enrique G. M. Maestas, and JoAnne DeRouen Darlington, "Race, Ethnicity and Disasters in the United States: A Review of the Literature," *Disasters* 23, no. 2 (1999): 156–173.

[190] Rozario, "Rising from the Ruins"; Glasmeier, interview by Peter Dizikes, "3 Questions: Amy Glasmeier on Rebuilding After Disaster Hits."

income populations also suffer from increased disaster vulnerability, transportation, and evacuation challenges, and limited financial resources for insurance or disaster preparedness.[191] Studies have shown a correlation between income level and the ability to respond and recover from disaster.[192] Lower income homeowners and renters are much less likely to carry insurance against natural disasters and are less likely to qualify for loans for recovery. The lower income population takes longer and recovers less fully from disaster.[193]

Watsonville took several steps to assist its low-income citizens. As described earlier, Watsonville leveraged financial assistance and put it into a grant program for reconstruction.[194] This policy enabled lower income households to finance reconstruction of their properties and recover. Transportation was arranged throughout the city for medical care and to enable citizens to travel to disaster application centers to apply for assistance. This action increased the ability of low-income and vulnerable populations to receive the assistance for which they were eligible.[195]

Watsonville established official roles for community-based organizations in its Community-Based Disaster Response plan. This action was a force multiplier in gathering information on the response and recovery needs of the community. The community-based organizations also had a role in guiding citizen input and prioritization of recovery projects.[196]

The earthquake struck Watsonville at 5:04 in the afternoon. Watsonville residents saw buildings collapse in front of them. The psychological shock of collapsed buildings led many residents to fear being indoors, and preferred to camp in tents (as shown in

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[191] Manuel Pastor et al., *In the Wake of the Storm: Environment, Disaster and Race After Katrina* (New York, NY: Russell Sage Foundation, 2006), 40–41.

[192] Robert C. Bolin and Patricia A. Bolton, *Race, Religion, and Ethnicity in Disaster Recovery* (Boulder, CO: Institute of Behavioral Science, University of Colorado, 1986), 54–60.

[193] Ibid.

[194] Comiero, *Housing Repair and Reconstruction After Loma Prieta*.

[195] Comiero, *Housing Repair and Reconstruction After Loma Prieta*.

[196] Ibid.

Figure 7) rather than risk building collapse.[197] This fear and caution was partially attributed to the experience of Watsonville's Mexican immigrants who lived through the devastating 1985 earthquake in Mexico City.[198] The disaster experience of Watsonville residents, along with a sense of community and resilient social structure,[199] reduced psychological issues as response turned to recovery. City officials showed a sense of acceptance towards the earthquake, and they realized that it provided opportunities to improve the city.[200]

Figure 7. Tent City in Watsonville, October 1989[201]

[197] Lewis Aptekar, *The Psychological Process of Adjusting to Natural Disasters* (Darby, PA: DIANE Publishing, 1993), 7.

[198] Ibid.

[199] Eadie, "Earthquake Case Study: Loma Prieta in Santa Cruz and Watsonville, California," 281–310.

[200] Ibid.

[201] Mark Gibson, "N124.01W16.JPG—Tent City Set Up Temporary Housing during Loma Prieta Earthquake 10/17/89 Watsonville California, "*Gibson Stock Photography*, October 17, 1989, http://www.markgibsonphoto.com/static/16657.html.

e. The Geopolitical and Sociological Need of the Case Study Community to Rebuild

The small-town work ethic of Watsonville was evident in a quote noted by Eadie that "the fact that people knew each other by their first names made it easier for people to be concerned with more than their own interests."[202] This statement is not to imply that recovery in Watsonville was without conflict.

A study of how effective the recovery was between the lower-income, Spanish-speaking immigrant households and primarily English-speaking white first responders and recovery personnel, showed conflict and perceived injustice in the recovery process. Language and cultural differences were also exacerbated by the general lower income of earthquake survivors.

Watsonville was in political upheaval before the earthquake as the city was being forced as a result of a lawsuit to convert to district elections to ensure representation of the Spanish-speaking immigrant community.[203] Distrust and political issues extended after the earthquake as elections were delayed. When the new city council was appointed, the recovery brought the community together, driven by new citizen committees addressing housing and commercial reconstruction. Wisely, these effective reconstruction committees were folded into the local government Economic Development Council.[204]

Improvised shelters and campsites in city parks were set up, despite the availability of several indoor Red Cross shelters in Watsonville.[205] These sites were popular among low-income Spanish-speaking immigrant community survivors for several reasons. First and foremost, residents were concerned for their safety, and found the outdoor campsites safer for their peace of mind. Confusion about building safety and inspection tags added to this phenomenon. English-only tags that identified homes as "red"—destroyed and unsafe, and "green"—safe to use were easy to understand.

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[202] Ibid.

[203] Eadie, "Earthquake Case Study: Loma Prieta in Santa Cruz and Watsonville, California," 281–310.

[204] Ibid.

[205] Brenda D. Phillips and Mindy Ephraim, *Living in the Aftermath: Blaming Processes in the Loma Prieta Earthquake* (Boulder, CO: Natural Hazards Center, University of Colorado Boulder, 1992).

Problems occurred with the many "yellow" tagged homes whose safety was uncertain.[206] Another advantage perceived by residents of the campsites is that they preserved family and social networks of survivors and were convenient to schools.[207] Lack of sanitation, refuse, and cooking facilities initially led the county to seek to close the campsites, but eventually yielded to local pressure and declared them official shelters, despite austere conditions.[208]

The conflict over the camps served a secondary role in allowing low-income minorities a platform to focus media and public attention on the need for affordable housing, led by a local health organization, Salud Para La Gente, which acted as an advocate for homeless, low-income residents, predominantly of the Spanish-speaking community.[209] They argued that the city acted with cultural and economic insensitivity through discouraging outdoor shelters. The Justice Department ruled in favor of the city, but also suggested increased participation in recovery planning efforts of community groups.[210] The speed at which Watsonville housing recovered after the earthquake lends weight to the idea that this political pressure was successful. In the 20+ years after the disaster, the city of Watsonville and its community groups continued recovery planning and hazard mitigation work together.[211] Phillips concludes by stating that these efforts have helped to heal past community race issues, increased the speed of recovery, and may be beneficial in mitigating future disaster impacts.[212] The experiences of Watsonville were adopted by other agencies and organizations in California in dealing with minorities and the economically disadvantaged.[213]

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[206] Ibid.

[207] Ibid.

[208] Ibid.

[209] Ibid.

[210] Phillips and Ephraim, *Living in the Aftermath: Blaming Processes in the Loma Prieta Earthquake*.

[211] Ibid.

[212] Ibid.

[213] Dennis Andrulis, Nadia Siddiqui, and Johnathan Purtle, *California's Emergency Preparedness Efforts for Diverse Communities* (Philadelphia, PA: Center for Health Equality, Drexel University, 2009), 16.

f. Summary

Abandoning Watsonville was not considered as an option, but the city's precarious economic situation at the time of the event presented the very real chance that the community could suffer severe consequences in recovery due to the scale of the event.

A finding by Eadie stated that a "window of opportunity" exists approximately six months after the disaster. Communities need to be able to capitalize on these opportunities through recovery planning, and a vision of what the post-disaster recovery needs of the community will be.[214] Watsonville did not completely hit the "window of opportunity," but it was able to rise to the challenges of the earthquake and a low-income minority population through inclusive practices, and modifying existing rigid response and recovery systems to meet the needs of its residents.

One primary finding of the Watsonville recovery is that effective post-earthquake housing recovery is very effective with pre-earthquake planning of the whole community, and its priorities and efforts following a disaster. Watsonville managed to recover, but it was done by trial and error in an ad-hoc manner. Identification of the limits and needs of a community's population lessens the difficulties of ad hoc decisions after the earthquake. Having community groups represented in the pre- and post-event recovery planning ensures that the community's needs are being addressed. The demographics of Watsonville enabled social groups struggling for low-income minority groups before the event to transform their activism into advocating and delivering affordable housing that met the needs of the population of Watsonville after the earthquake. An important component in Watsonville's successful recovery was incorporating these community groups into the city recovery at the policy level.

Identifying procedures and policies of planning and permitting before an event was identified in several studies as a key component in successful recovery. This pre-event planning should consider the need to reassess land use policies and alternate uses of zoned property to accommodate the requirements of a city in recovery. Pre-event

[214] Eadie, "Earthquake Case Study: Loma Prieta in Santa Cruz and Watsonville, California,"281–310.

decisions on how non-conforming uses and re-zoning of properties is essential to prevent land use conflicts. In Watsonville's case, it is apparent that the health of the national and state economy can impact the speed, method, and effectiveness of recovery. While a local community has little control over these economic conditions, planners need to be aware of how decreased economic activity nationwide could impact local recovery.

When a disaster "redraws" the land use map and the way that a community uses its space, displaced people and businesses cause conflict and pressure on existing zoning. In areas with strict land use codes, issues similar to the Watsonville experience can arise when trying quickly to locate temporary housing to a compatible zoning designation. It is suggested that temporary zoning be created to accommodate these necessary but conflicting uses to provide legal temporary locations for the establishment of locations for housing, support structures, and businesses as recovery occurs. Pre-establishing these planning criteria would limit conflicts after the event and provide a forum to discuss how a community is going to function post-disaster.[215]

Lastly, as this nation becomes increasingly diverse, multilingual and culture/economic class-specific outreach and information on the policies, procedures, and actions to be taken after an event supports the research finding that inclusion of all residents leads to positive recovery results. To quote Haas, Kates, and Bowden, "Overlooking people and their problems is tantamount to increasing the effects of disaster."[216]

C. HISTORICAL CATASTROPHIC DISASTER CASE STUDY #3—VALDEZ, ALASKA, FOLLOWING THE 1964 GREAT ALASKA EARTHQUAKE AND TSUNAMI

1. Background

An immense 9.2 magnitude earthquake occurred offshore of Alaska in Prince William Sound on March 27, 1964. The epicenter was approximately 56 miles west of

[215] Jim Schwab et al., *Planning for Post-Disaster Recovery and Reconstruction* (Washington, DC: Federal Emergency Management Agency, 1988), 68.

[216] Haas, Kates, and Bowden, *Reconstruction Following Disaster*.

Valdez and 75 miles east of Anchorage.[217] Liquefied soil from the earthquake shaking caused the town to slump as the stability of structures gave way.[218] The earthquake (the second largest ever recorded in the Western Hemisphere), caused the slumping of a 1,220 meter (.75 mile) long and 183 m (.11 mile) wide portion of the river delta.[219] A large volume of underwater sediments displaced a considerable amount of water, which generated a 30 to 40 foot local tsunami that came ashore in three minutes and destroyed structures still standing after the earthquake shaking.[220] The tsunami destroyed much of the Valdez waterfront and the entire fishing fleet along with it. The wave run-up continued into the city, which caused $15 million ($86,974,378.26 in 2013 dollars) in damage, and killed 30 residents.[221] Making matters worse, the Union Oil Company storage tanks ruptured and ignited a large fire that destroyed what remained of the waterfront.[222]

Thousands of aftershocks greater than 6.0 in magnitude and their resultant tsunamis struck Valdez and the rest of Prince William Sound months after the initial event.[223]

As Valdez looked to recover from the event, it was determined that the liquefiable soil the damaged city was built upon was unstable and a deadly vulnerability to a future similar event. The U.S. Army Corps of Engineers conducted research and developed a

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[217] Alaska Earthquake Information Center, University of Alaska, Fairbanks, "The Great Alaska Earthquake of 1964," last modified March 11, 2014, http://www.aeic.alaska.edu/quakes/Alaska_1964_earthquake.html.

[218] USC Tsunami Research Group, "The 1964 Tsunami Strikes Valdez," last modified March 11, 2014, http://www.usc.edu/dept/tsunamis/alaska/1964/webpages/1964valdez.html.

[219] National Geophysical Data Center, "Aerial View of Valdez, AK after 1964 Tsunami," last modified March 18, 2014, http://www.ngdc.noaa.gov/hazardimages/picture/show/515.

[220] Alaska Earthquake Information Center, University of Alaska, Fairbanks, "The Great Alaska Earthquake of 1964."

[221] National Geophysical Data Center, "Aerial View of Valdez, AK after 1964 Tsunami."

[222] USC Tsunami Research Group, "The 1964 Tsunami Strikes Valdez."

[223] Ibid.

site on more stable geology four miles from the old town site.[224] The original town of Valdez was dismantled and abandoned.

2. Data and General Analysis

a. Economic Impacts and Financial Support for Recovery

The total amount of damage to the State of Alaska after the earthquake was estimated at $2,045,822,921.95 (2013 dollars); the damage to the City of Valdez was estimated at $49,082,540.80 (2013 dollars).[225]

Recovery efforts were centered in the City of Anchorage, due to its population base and military presence. Despite being in a remote location, recovery for cities in Prince William Sound, such as Valdez, was robust for a rural area, including $37,500,000 ($217,435,945.64 in 2013 dollars**)** to move the city to a new location.[226] This pace of recovery was likely due to the emerging importance of Prince William Sound for oil exports,[227] and the fairly large amount of freight (4% of the state's total) that the port handled.[228]

Economic recovery was the focus of Kunreuther and Fiore's study on the 1964 Alaskan Earthquake. Postulating that disasters of this magnitude may be a "blessing in disguise," the study concluded that the disaster created an opportunity for commercial, residential, and infrastructure improvements given that significant sources of grants and affordable loans for reconstruction were available and that old establishments were destroyed, which allowed for replacement rather than renovation.[229] Abandoning the old

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[224] Valdez Convention and Visitors Bureau, "Valdez History—1964 Good Friday Earthquake," last modified March 18, 2014, http://www.valdezalaska.org/discover-valdez-history/valdez-history-1964-good-friday-earthquake.

[225] Institute of Business, Economic and Government Research, *The Economic Impact of the Alaskan Earthquake* (Anchorage, AK: University of Alaska, 1964), 1–8.

[226] National Oceanic and Atmospheric Administration, Department of Commerce, "Great Alaska Earthquake, Prince William Sound, March 28, 1964,: last modified April 6, 2011, https://catalog.data.gov/dataset/great-alaska-earthquake-prince-william-sound-march-28-1964.

[227] Claus Naske, *Alaska: A History* (Norman, OK: University of Oklahoma Press, 2011), 241–278.

[228] Institute of Business, Economic and Government Research, *The Economic Impact of the Alaskan Earthquake*, 1–8.

[229] Kunreuther and Fiore, *The Alaskan Earthquake—A Case Study in the Economics of Disaster*, xvi.

city made sense financially and for safety. Confirming the findings of Kunreuther and Fiore, the City of Valdez Public Works Director Edward Martin described the event as "good for Valdez" when describing a "shabby" town and depressed economy prior to the earthquake.[230] A caveat to the finding is that, even with substantial aid, without a population motivated to rebuild and improve their community, successful recovery may not occur.[231]

The Small Business Association (SBA) provided loans to replace physical damages after the earthquake. A key change to their policy in Alaska was to allow the loans to cover modernization and improvements to properties and debt recovery. This practice was concluded to have stimulated the urge and scale of reconstruction in Alaska.[232] This SBA practice does not exist today as requirements for SBA loans indicate, "Homeowners may apply for up to $200,000 to replace or repair their primary residence. The loans may not be used to upgrade homes or make additions, unless required by local building code."[233] The speed in which SBA loans were processed may have benefitted the recovery, and the economic restoration of New Valdez and other areas in Alaska.[234] The provision in SBA loans to allow debt retirement prevented both commercial and personal bankruptcies in Alaska following the earthquake permitted businesses, homeowners, as well as Alaskan financial institutions that would have struggled to deal with the economic after effects.[235] Additionally, in reconstruction, Valdez placed an emphasis on tourism in economic revitalization,[236] a decision that diversified the economy and brought with it new types of income to the city.

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[230] National Research Council, *The Great Alaska Earthquake of 1964, Human Ecology* (Washington, DC: National Academy of Sciences, 1968), 356.

[231] Kunreuther and Fiore, *The Alaskan Earthquake—A Case Study in the Economics of Disaster*, 65.

[232] Ibid., 97–115.

[233] U.S. Small Business Administration, "Types of Disaster Loans," last modified March 20, 2014, http://www.sba.gov/content/home-and-personal-property-loans.

[234] Kunreuther and Fiore, *The Alaskan Earthquake—A Case Study in the Economics of Disaster*, 97–115.

[235] Ibid.

[236] National Research Council, *The Great Alaska Earthquake of 1964, Human Ecology*, 69.

A common finding of research cited was that large financial assistance enabled Alaska to recover quicker and with improved facilities because of federal disaster aid. Some have argued that the federal aid has never stopped. As noted in a *New York Times* article, historian Victor Fischer, who helped to write the state's constitution noted that 1964 Alaskan earthquake response and recovery funding was "a tremendous boost" and that "we built the state with that money."[237] Federal spending in Alaska was 38% higher in 1996 and has increased every year since; in 2010, it was 71% higher than the other 50 states.[238] University of Anchorage Economics Professor, Scott Goldsmith, estimated that 1/3 of Alaskan jobs depend on federal spending either directly or indirectly.[239] Given the large amount of federal land in Alaska, the large amount of federal land ownership requires a large federal financial investment. The amount of federal monies that Alaska receives does not seem analogous to Nevada, which has a larger percentage of federal land,[240] but is ranked 50th among states for federal funding.[241]

b. Natural Barriers to Recovery

Responding to and recovering from disaster is more challenging in rural Alaska than in many of the other states. Alaska imports approximately 95% of its food[242] and is dependent on the lower 48 states for the vast majority of refined fuel and manufactured goods.[243] The remoteness of Valdez is shown in the location map in Figure 8.

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[237] Michael Powell, "How Alaska Became a Federal Aid Magnet," *The New York Times*, last modified August 8, 2010, http://economix.blogs.nytimes.com/2010/08/18/how-alaska-became-a-federal-aid-magnet/?_php=true&_type=blogs&_php=true&_type=blogs&_r=1.

[238] Ibid.

[239] Gunnar Knapp, *An Introduction to the Economy of Alaska* (Anchorage, AK: University of Alaska Anchorage, 2012), http://www.iser.uaa.alaska.edu/Publications/presentations/2012_02-Introduction_to_Economy_of_Alaska.pdf.

[240] New York Times, "The Open West, Owned by the Federal Government," last modified March 23, 2012, http://www.nytimes.com/interactive/2012/03/23/us/western-land-owned-by-the-federal-government.html?ref=utah&_r=0.

[241] Molly Ball and Francis McCabe, "Nevada's Per Person Share Low," *Las Vegas Review-Journal*, last modified February 23, 2009, http://www.reviewjournal.com/news/nevadas-person-share-low .

[242] Deirdre Helfferich and Nancy Tarnai, "Alaska's Food (in) Security," *Agroborealis* 41, no. 1 (2010): 23–27.

[243] Richard D. Koehler et al., *Pacific Northwest Earthquakes and Potential Effects on Alaska-Miscellaneous Publication 148* (Fairbanks, AK: State of Alaska Department of Natural Resources, Alaska Seismic Hazards Safety Commission, Alaska Division of Geological & Geophysical Surveys, 2012), 8.

The Richardson Highway (stretching from Fairbanks to Valdez and connecting to the Glenn Highway connecting Valdez and Anchorage) had little damage unlike roadways in other affected communities. Only slight damage was reported that the surface of the roadway was "wavy," which allowed the movement of relief supplies to Prince William Sound.[244]

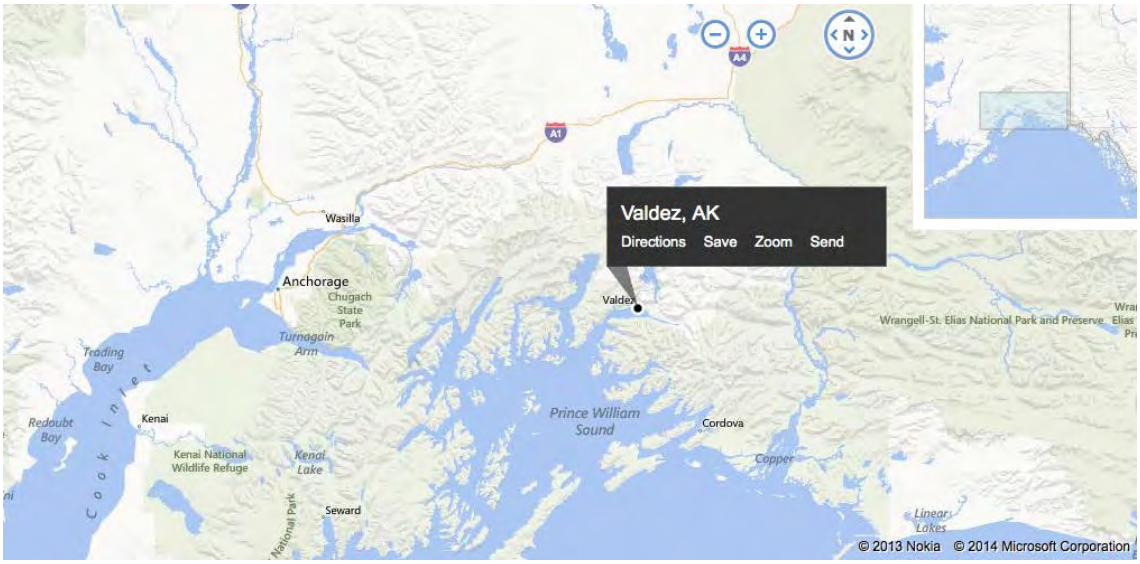

Figure 8. Location Map of Valdez, Alaska[245]

The Prince William Sound is of primary importance to the Alaskan economy for shipping, as Valdez is one of the only ice-free all-weather ports in the state. The destruction of the port in Valdez impacted interior Alaska and also reduced the movement of resources to Fairbanks and the interior of Alaska.[246] Due to a land ownership and right-of-way feud, rail to the City of Valdez was never established prior to

[244] Arthur Grantz, George Plafker, and Reuben Kachadoorian, *Alaska's Good Friday Earthquake, March 27, 1964—A Preliminary Geologic Evaluation* (Washington, DC: United States Department of the Interior, 1964), 25.

[245] Created by author using Bing Maps online map tool.

[246] *U.S. Geological Survey, Effects of the Earthquake of March 27,1964, on Air and Water Transport, Communications, and Utilities Systems in South-Central Alaska* (United States Department of the Interior, Washington, DC: United States Government Printing Office, 1967), B7.

1964 despite plans for doing so.[247] Not having rail limited relief and recovery supplies greatly.

This dependence on trade and the challenges of delivering resources required an airlift of supplies, teams, and resources to provide relief and long-term recovery to Valdez.[248] Valdez's airport tarmac and runways were cracked, but usable, which enabled response and short-term recovery to remain viable until increased oceangoing support could arrive.

Alaska, due to extreme northern winters, has an abbreviated building season confined to several months between late spring and early autumn. Due to this physical limitation, it required creative policies to expedite building approval and management of the building process to allow an entirely new city to be built in four years of seasonally shortened building seasons.[249]

c. Land Use and Mitigation Planning Recovery Issues

On April 27, 1964, (one month after the earthquake), the Valdez City Council recognized the need for land use change after the destruction of much of its waterfront and the findings of a U.S. Geological Survey (USGS) geological report on the stability and safety of reconstruction. Figure 9 shows the location of the Old Valdez City location. A resolution was passed recognizing the need for the community to be moved to the location of the present city of Valdez;[250] this act set into motion a rapid recovery and moving of the city of Valdez to its new location.

Survivors also recognized the need to relocate, after being witness to the devastation of the earthquake. Analysis of locations near the city determined the best location was located approximately four miles northwest near Mineral Creek. The new

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[247] Mohammad Jawed Hameedi, "Natural and Historic Setting," in *Environmental Studies in Port Valdez, Alaska*, ed. D. G. Shaw (Berlin Heidelberg New York: Springer-Verlag, 2013), 1–15.

[248] Chris McCann. "50 Years Since 1964 Earthquake Catastrophe: Military Integral to Recovery," *Joint Base Elmendorf-Richardson*, last modified March 24, 2014, http://www.jber.af.mil/news/story.asp?id=123404631.

[249] Dwight Ink, "Managing Large-Scale, Time-Urgent Presidential Initiatives," *Memos to Leaders*, March 31, 2014. www.memostoleaders.org/sites/default/files/Memo1_2.pdf.

[250] National Research Council, *The Great Alaska Earthquake of 1964, Human Ecology*, 356.

location was built on stable geology that showed no signs of deformation after the earthquake. It was on higher ground and less vulnerable to tsunamis.[251]

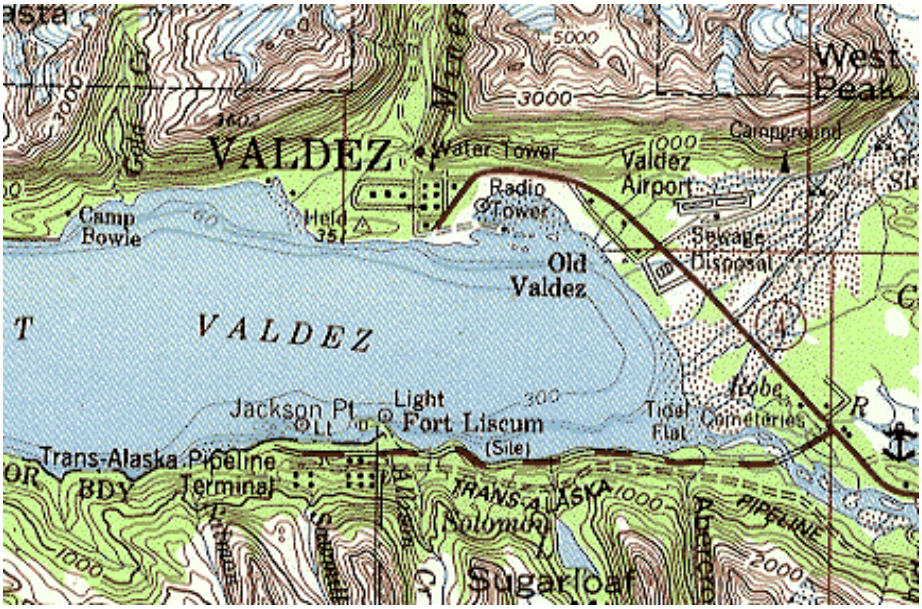

Figure 9. Location Map of Old Valdez, Alaska[252]

President Lyndon B. Johnson established the Federal Reconstruction and Development Commission for Alaska in an effort to streamline recovery.[253] With an objective of restoring what was lost and to use the disaster as a catalyst to promote future development, extensive financial aid drove joint federal-state and local task forces on reconstruction to establish new building codes and the creation of a new city boundary and plan.[254] Federal assistance required that reconstruction contain seismic standards, such as stronger building materials, flexible materials, and adequate foundations for construction in the new city. The plans also enabled the city to enact plan guidance for

[251] Alaska Division of Geological and Geophysical Surveys, *Geologic Studies of Critical Areas: Valdez Alaska* (Fairbanks, AK: Alaska Division of Geological and Geophysical Surveys, 1987), 1.

[252] Alaska Climate Research Center, "Old Valdez, Alaska," accessed April 3, 2014, http://climate.gi.alaska.edu/history/southcentral/ValdMap.gif.

[253] Barclay Jones, *Economic Consequences of Earthquakes: Preparing for the Unexpected* (Buffalo, NY: MCEER Publications, 1995), preface, http://mceer.buffalo.edu/publications/workshop/97-SP01/preface.asp.

[254] Ibid.

fire hazards and snow removal, which allowed the new city to take a proactive approach to civic problems.[255] Unlike the regulations against returning to their homes in L'Aquila Italy (2009), civil defense passes were given to citizens for access to their homes and property while reconstruction occurred.[256] Recovery was conducted transparently in public meetings that involved citizen input, which fostered a rapid reconstruction of the new town in three years. Under the challenges of a shortened construction season, building standard upgrades were initiated and safer buildings were constructed in the new city. Mitigation of future disaster effects was given high priority.[257] Strong federal and state leadership in requiring mitigation for future disaster safety enabled the Alaskan recovery to avoid the pitfalls described by Mader in which regulations and restrictions are relaxed in an effort to "return quickly to normal."[258] Relocation was completed in October 1967.[259]

Mitigation against future seismic events was built into designs of the new city and was continued as the city continued to grow after 1967. Zoning and land use codes took into account areas of seismic danger and tsunami inundation. As the city grew, building standards continued to remember and take heed the lessons of the Good Friday Earthquake. The Alaskan Pipeline, a major component of the Valdez economy, was constructed within strict seismic guidelines.[260]

The awareness and fear of developing in the geologic hazard areas of old Valdez seem to be fading as the time from the earthquake passes. Restrictions on building put in place after the 1964 earthquake are expiring after 50 years. Currently, the city is

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[255] Andrew Goldstein, "Alaska Disasters AMA: 1964 Good Friday Earthquake and 1989 Exxon Valdez Oil Spill," *Reddit Ask Historians*, http://www.reddit.com/r/AskHistorians/comments/20wt9u/alaska_disasters_ama_1964_good_friday_earthquake/.

[256] Tony Gorman, "Valdez Museum Prepares Commemorates 1964 Quake," *Alaska Public Media*, last modified March 21, 2014, http://www.alaskapublic.org/2014/03/21/valdez-museum-prepares-commemorates-1964-quake/.

[257] Jones, *Economic Consequences of Earthquakes: Preparing for the Unexpected*.

[258] George G. Mader, *Land Use Planning After Earthquakes* (Portola, CA: National Science Foundation, 1980), 5.

[259] Ink, "Managing Large-Scale, Time-Urgent Presidential Initiatives."

[260] Michael E. West et al., "Why the 1964 Great Alaska Earthquake Matters 50 Years Later," *Seismological Research Letters* 85, no. 2 (March/April 2014): 245–251.

developing a master plan for the old town site, currently split into three zones. The most dangerous, Zone A, restricts all development. Zone B is less dangerous and contains light industrial uses. Zone C has a less hazardous rating and contains more dense development. As the moratorium on building expires, plans for industrial development in Zone A and tourism-residential development (an RV park) in Zone B has been developed. These plans did not come to fruition, but increased planning proposals will likely occur as the 50-year moratorium ends.[261]

d. The Social and Psychological Stresses of the Loss of Community

The assertions by Quarantelli and Dynes of disaster survivors wanting to remain in their community, and are not psychologically shocked by the event to the point of inaction, were true of Alaskans after the earthquake.[262] Then Alaskan Governor Bill Egan, a Valdez resident, described this assertion on an official visit on Easter Sunday 1964 (two days after the earthquake and tsunami, and in the midst of aftershocks). The governor witnessed residents making initial repairs to damaged walkways.[263]

The cooperation of Alaskans after the earthquake was described as a community bonded by a common event was also described by Kunreuther and Fiore. Families offered freely to house their now-homeless neighbors. The communities across the state generally worked together and assisted in response and recovery activities. The study described, "The most admirable human qualities were exhibited by practically all the Alaskan residents."[264] The spirit of assistance and good behavior witnessed in 1964 exists today in the assumptions of the Alaskan Emergency Operations Plan, which describes that "Alaskans will want to be helpful. Volunteers and those offering services for pay will

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[261] Yereth Rosen, "Condemned No More; 50 Years After Huge Earthquake, Building Moratorium Expiring in Valdez," *Alaska Dispatch*, March 23, 2014, http://www.alaskadispatch.com/article/20140323/condemned-no-more-50-years-after-huge-earthquake-building-moratorium-expiring.

[262] Enrico L. Quarantelli and Russell R, Dynes, "When Disaster Strikes (It Isn't Much Like What You've Heard and Read About)," *Psychology Today* 5 (1972): 67–70.

[263] Lee Revis, "A Look Back at Day of 1964 Earthquake Fifty Years Later, Town Commemorates Disaster Milestone," *Valdez Star*, March 26, 2014, http://www.valdezstar.net/story/2014/03/26/main-news/a-look-back-at-day-of-1964-earthquake/500.html.

[264] Kunreuther and Fiore, *The Alaskan Earthquake—A Case Study in the Economics of Disaster*, 141.

come forward. They will need resourceful leadership" and "Alaskans will not riot, take unlawful advantage of those victimized, or tolerate those who attempt such behavior."[265]

A strong sense of this community caring for the community was witnessed in economic interactions after the earthquake. Studies were completed that showed despite the scarcity of resources, community support led to non-inflationary economic activity throughout Alaska. Storeowners with undamaged supplies and storefronts were willing to keep necessities for recovery at reasonable prices for those community members in need. Some store managers were authorized to change prices to support the community. In some cases, prices were lower after the earthquake.[266] Alaskans returned the favor in a spirit of support for their neighbors. Rather than hoarding food and supplies at lower or stable prices, Alaskans were considerate and concerned with one another, which occurred without the implementation of price controls.[267] Prices remained stable in the five Alaskan cities, including Valdez. The goodwill support also flowed from the lower 48 states with shippers in the Puget Sound lowering shipping rates to Alaska.[268]

Rationing of gasoline did occur, not because of shortages, but for concern over the condition of roadways and of residents leaving the area, having the dual concern of evacuee safety and the exodus of the population from a devastated area. This concern was a prudent decision in the Anchorage area due to the destruction of highways out of the city.[269] As described, the Richardson Highway out of Valdez was in usable condition, but the remoteness of Valdez made short-term, self-evacuation impractical. Large numbers of Valdez citizens did leave the severely damaged city when they were able to seek shelter on the way to Fairbanks in the Tsania Lodge (34 miles northeast) and Glenallen (116

[265] State of Alaska, Division of Homeland Security and Emergency Management, *State of Alaska Emergency Operations Plan* (Anchorage, AK: State of Alaska, 2013), 7.

[266] Kunreuther and Fiore, *The Alaskan Earthquake—A Case Study in the Economics of Disaster*, 38.

[267] Ibid., 139.

[268] Ibid., 39.

[269] Ibid., 14.

miles to the north). The spirit of community assistance continued to shine with many homes along the highway having signs reading that they had space for evacuees.[270]

As Valdez began recovering, families left the area temporarily for safety and supply concerns. Typically, evacuees live close to the disaster area and return quickly. In Alaska, due to the extent of the disaster and the remoteness of the state, many evacuees from Anchorage sought shelter with families and friends in the lower 48 states, the majority of those in Valdez seeking shelter in Fairbanks. This distance marginally increased the time of return to their communities for those evacuees.[271] Without large federal efforts to hasten the speed of recovery for Alaska, the time required for reconstruction would have likely increased. The lack of these efforts would have most likely led to a sense of abandonment in evacuees similar to that felt by the residents of L'Aquila Italy in 2009[272] and of Hurricane Katrina evacuees studied in Houston.[273]

The event allowed Alaska to rebuild not only Valdez, but rebuild its understanding of the geologic hazards and challenges of geography. Education and awareness of earthquake drills, tsunami evacuation routes, and 72-hour preparedness is given extra magnitude when the 1964 event is included in the discussion.[274]

e. The Geopolitical and Sociological Need of the Case Study Community to Rebuild

> I believe that in the future, whoever holds Alaska will hold the world. I think it is the most important strategic place in the world.
>
> —Brigadier General Billy Mitchell,
> U.S. Army Air Service to Congress in 1935.

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[270] Revis, "A Look Back at Day of 1964 Earthquake Fifty Years Later, Town Commemorates Disaster Milestone."

[271] Kunreuther and Fiore, *The Alaskan Earthquake—A Case Study in the Economics of Disaster*, 64.

[272] Alexander, "An Evaluation of Medium-Term Recovery Processes After the 6 April 2009 Earthquake in L'Aquila, Central Italy," 60–73.

[273] Mortensen, Wilson, and Ho, "Physical and Mental Health Status of Hurricane Katrina Evacuees in Houston in 2005 and 2006," 524–538.

[274] West et al., "Why the 1964 Great Alaska Earthquake Matters 50 Years Later," 245–251.

In 1964, Alaska had only been a state for five years and was identified as strategically important prior to World War II by the Alaskan Territorial Delegate who successfully sought American military installations in the territory. This effort increased dramatically after the Japanese invasion of the Aleutian Islands. As the war ended, Alaska's governor Ernest Gruening became frustrated that the state still lacked adequate infrastructure and would likely not see significant federal assistance without statehood.[275] Efforts in the state to gain statehood were given additional weight due to the Cold War geographic, strategic, and economic significance of the Arctic.

When the 1964 Good Friday earthquake and tsunami ravaged the state, Alaska had a limited ability to respond, and based on location and supply challenges, and an inability to recover from the disaster without large amounts of federal aid.[276] As lifesaving turned to long-term recovery, it was clear that wholesale evacuation was not an option, nor was abandoning large parts of the state. The federal government needed Alaska to recover fully. The geopolitical and economic importance of Alaska to the United States has been identified as a primary reason for the rapid influx of financial assistance and federal support.[277]

The large U.S. military presence in the state prior to the earthquake enabled a faster recovery in Alaska and the strategic importance of the state was recognized as a driver for reconstruction.[278] Alaska's location close to the Soviet Union gave the United States an important outpost for defensive actions. The Distant Early Warning Line (DEW) was completed in 1957 and provided North America the possibility of early detection in the event of a Soviet Nuclear attack.[279] Alaska provided detection, interception, and defense against attack; it also provided a shorter polar air route to

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[275] Eric Gislason, "A Brief History of Alaska Statehood," *Alaska Statehood Celebration Commission*, April 10, 2014, http://www.gov.state.ak.us/ASCC/pdf/HistoryofAlaska.pdf.

[276] McCann. "50 Years Since 1964 Earthquake Catastrophe: Military Integral to Recovery."

[277] Jones, *Economic Consequences of Earthquakes: Preparing for the Unexpected.*

[278] Kunreuther and Fiore, *The Alaskan Earthquake—A Case Study in the Economics of Disaster*, 56.

[279] Joseph F. Bouchard, "Guarding the Cold War Ramparts: The U.S. Navy's Role in Continental Air Defense," *Naval War College Review*, 1999, 111–135.

Europe to support U.S. allies and a transition point for the movement of troops and equipment to points in Asia.[280]

The decision of the federal government to assist quickly and economically decisively in Alaska, including the rebuilding of Valdez in a new location, enabled the state to rebuild better, but also cemented the use and continued importance of Alaska as a critical arctic geopolitical location. The United States has recognized the continued importance of the arctic in National Security Policy Directive 66, which defined the economic and geopolitical importance of Alaska for the United States, by describing it as an "Arctic Nation."[281] As the Alaskan oil pipeline was developed with its terminus at Valdez for export, it is likely the investment has paid dividends since 1964, throughout the Cold War, and the recent posturing of the U.S. military towards Asia, as well as increased oil exploration in the Arctic by other nations.[282]

f. Summary

The complete devastation of the City of Valdez occurred at a turning point in Alaskan and American history. Alaska was a new state, remote with limited resources for response and recovery. Without the large federal financial intervention to bring relief and reconstruction to remote areas dependent on the lower 48 states for food and fuel, it is reasonable to have expected recovery to languish, which would have impacted the future economic and oil production improvements that occurred post-1964.

The disaster, along with the immense federal financial aid, provided a springboard for proactive land use planning for Alaskan communities. The decision to relocate and rebuild the city enabled the infrastructure improvements and presented an opportunity to re-envision the social, economic, and infrastructure of the community, by incorporating seismic resilience and mitigation against future devastation into reconstruction.

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[280] Marc V. Schanz, "Strategic Alaska," *Air Force Magazine*, November 1, 2008, 46–49.

[281] Richard C. Powell and Klaus Dodds, *Polar Geopolitics?: Knowledges, Resources and Legal Regimes* (Northampton, MA: Edward Elgar Publishing, 2014).

[282] Nick Snow, "Countries Moving Geopolitically on Arctic Energy, Wilson Forum Told," *Oil and Gas Journal* 112, (2014), http://www.ogj.com/articles/2014/01/countries-moving-geopolitically-on-arctic-energy-wilson-forum-told.html.

Valdez residents coalesced around the horrors of the disaster; they (along with others in Alaska) were generous to their neighbors in need by sharing shelter and resources to these neighbors. This action resulted in less sociological problems than those faced by the other case study communities and likely hastened recovery.

Alaska sits at a critical geographic location for American Cold War defenses. The need for America to have Alaska as a functioning and economically productive state appears to have driven the large federal reconstruction efforts. Just as Alaska was dependent on the lower 48 for food and resources, the rest of the United States was dependent on Alaska as an Arctic first line of defense against the Soviet Union. Having an earthquake-shattered state with limited recovery in such a critical geopolitical location was not an option for the United States.

IV. SEASIDE, OREGON, AND THE CASCADIA SUBDUCTION ZONE

A. OVERVIEW OF THE CITY AND SEISMIC THREAT

1. Demographics, Economic, and Social Information

The City of Seaside, Oregon, (location map and aerial photo are depicted in Figures 10 and 11) is one of the most visited cities on the Oregon Coast due to its proximity (approximately 80 miles) to the City of Portland. The city has a population of 6,457 persons (2010) and a population density of 1,641 persons per square mile.[283] The population is primarily white, which makes up 88.1% of the population. The second largest ethnicity is Hispanic or Latino, which makes up 12.4% of the city population (a 107.25% increase from the year 2000). Also, 9.4% of the Seaside population speaks a language other than English at home.[284]

The Seaside homeownership rate is calculated at 50.7% with a median value home being valued at $280,800.[285] The vacancy rate in Seaside was estimated at 36% in 2010. This number is common for a tourist town, in which many of the vacant homes are rentals or second homes.[286] The tourist and retirement nature of the city is also shown in its percentage (17.4%) of people age 65+, which is greater than the state average, and the percentage of the population aged under 18 and under 5, which is lower than the state average.[287] In addition, 17.7% of citizens of Seaside live below the poverty level (the Oregon State average is 15.5%), and the median household income is $43,085 (compared with an income of $50,036 in the rest of the state).[288]

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[283] U.S. Census Bureau, "State and County Quickfacts-Seaside (City) Oregon," March 27, 2014, http://quickfacts.census.gov/qfd/states/41/4165950.html.

[284] Ibid.

[285] Ibid.

[286] City of Seaside Planning Department, *Comprehensive Plan Amendment—Goal 10 Housing and Residential Land Needs* (Seaside, OR: City of Seaside, 2014).

[287] U.S. Census Bureau, "State and County Quickfacts-Seaside (City) Oregon."

[288] Ibid.

The economy in Seaside is primarily focused on tourism, with accommodation, recreation, and food services being the primary employers in the city.

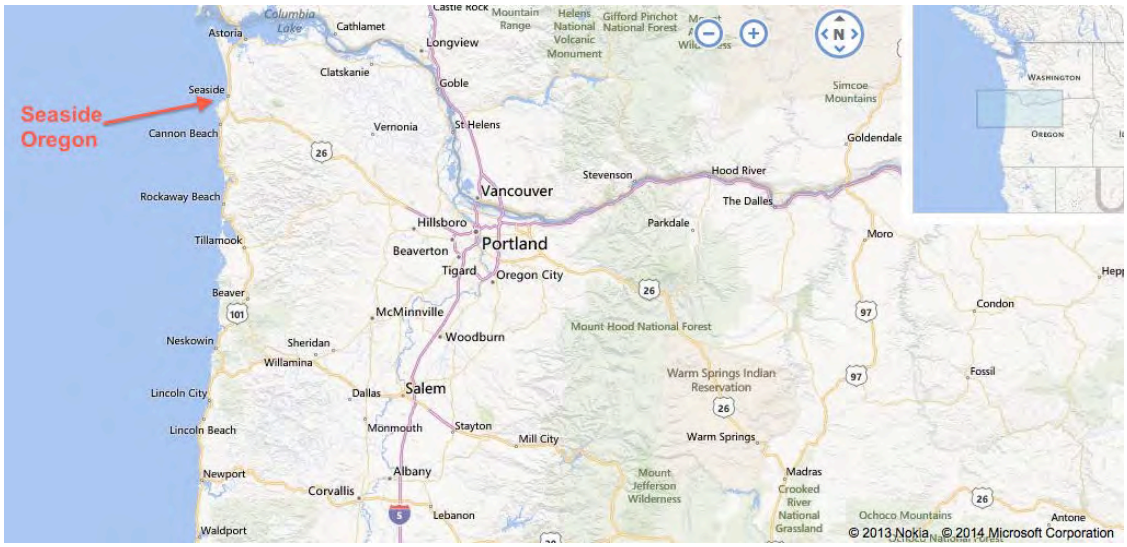

Figure 10. Location Map of Seaside, Oregon[289]

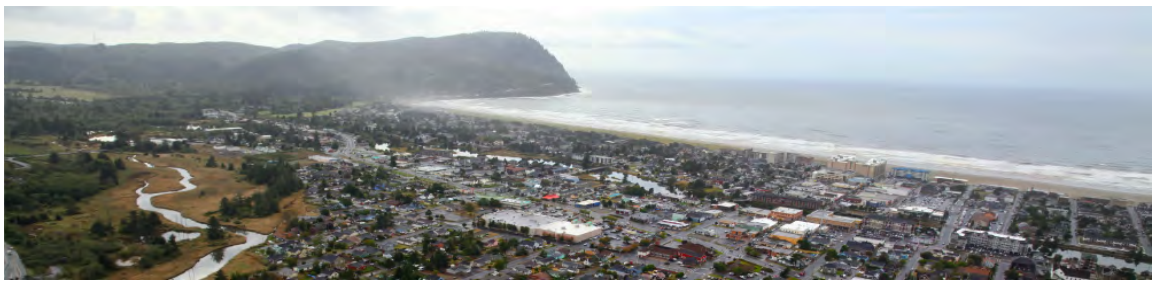

Figure 11. Aerial View of Seaside, Oregon[290]

2. Dire Impacts of a Cascadia Subduction Zone Earthquake and Tsunami on the City of Seaside

As previously described, Seaside, Oregon, has the most concentrated vulnerabilities to damage as a result of a CSZ earthquake and tsunami[291] (see Figures 12 and 13). Seaside has 83% of its population and 100% of its critical facilities in the

[289] Created by author using Bing Maps online map tool.

[290] "City of Seaside Visitors Bureau," accessed April 14, 2014, http://www.seasideor.com/.

[291] Oregon Department of Transportation Bridge Engineering Section, *Seismic Vulnerability of Oregon State Highway Bridges* (Salem, OR: State of Oregon, 2009).

tsunami inundation zone. Making matters worse is the topography of the city, which is located less than 17 feet above sea level.[292] Being the closest area to the epicenter of the earthquake, extreme effects are to be expected. Ground shaking from a 9.0 magnitude earthquake is estimated to occur for up to five minutes and would result in significant casualties and structural damage.[293] The tsunami generated by the earthquake would reach Seaside in 15–30 minutes and cause further loss of life and damage to the impacted city.[294] Structures not built to modern codes are not expected to survive. Much of the coastal residential inventory is likely to be damaged or destroyed by the tsunami, which may travel more than a mile inland in places. Waves may continue periodically as aftershocks continue well past the initial quake.[295]

Seaside is connected primarily by State Highway 26, which traverses hilly, landslide prone terrain and crosses rivers with bridges not expected to survive. Access by road following the earthquake is likely to require a month or more of continuous effort by construction crews and engineers as depicted by the estimated roadway damages map in Figure 14.[296] Telecommunication, petroleum, and natural gas supplies will be either destroyed or depleted. Response and initial recovery will be delayed due to the earthquake's impacts regionwide.

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[292] U.S. Department of Homeland Security, Homeland Infrastructure Threat and Risk Analysis Center, *Draft Analytical Baseline Study for the Cascadia Earthquake and Tsunami* (Washington, DC: U.S. Department of Homeland Security, 2011).

[293] Ibid.

[294] Ibid.

[295] Oregon Office of Emergency Management, *State of Oregon Cascadia Subduction Zone Catastrophic Earthquake and Tsunami Operations Plan* (Salem, OR: State of Oregon, 2012).

[296] Ibid.

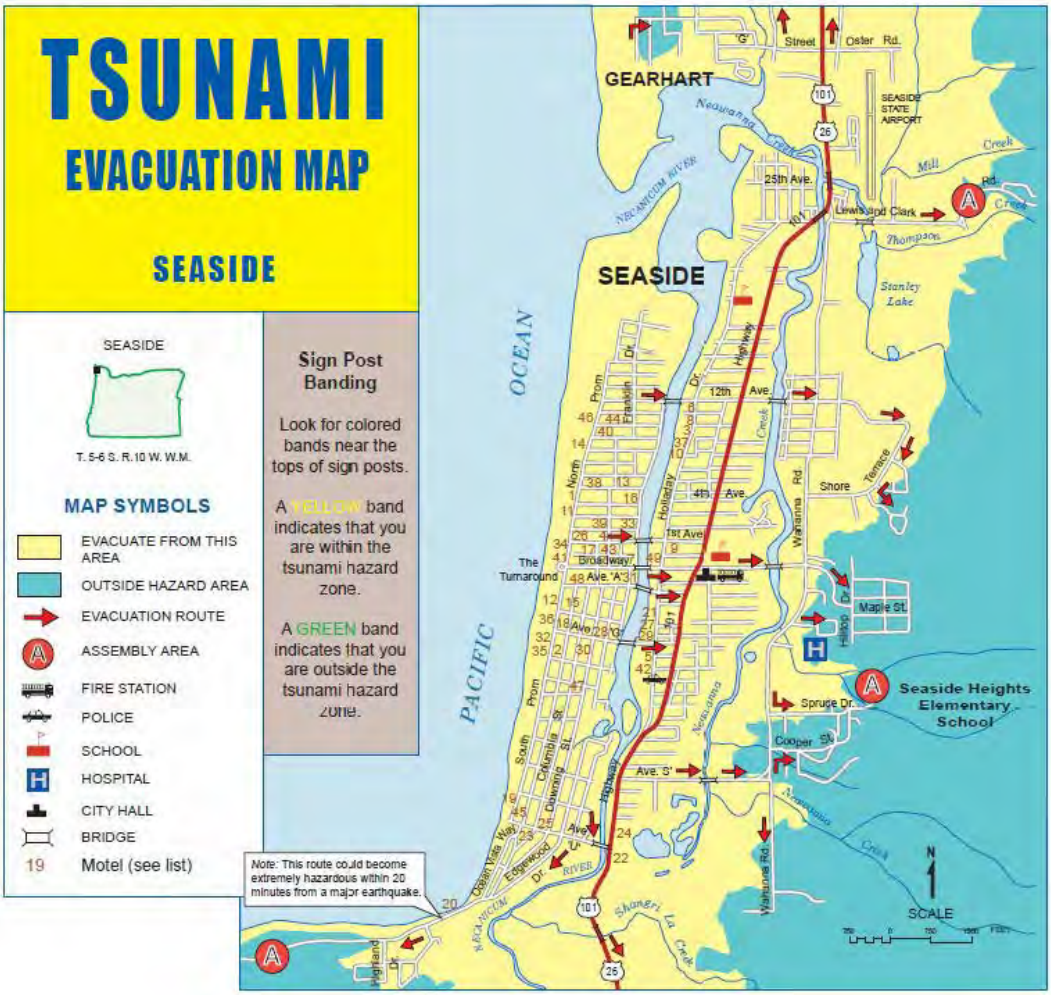

Figure 12. Tsunami Evacuation Map for Seaside[297]

[297] Federal Emergency Management Agency (FEMA) Region X, *Cascadia Subduction Zone (CSZ) Catastrophic Earthquake and Tsunami Response Plan*.

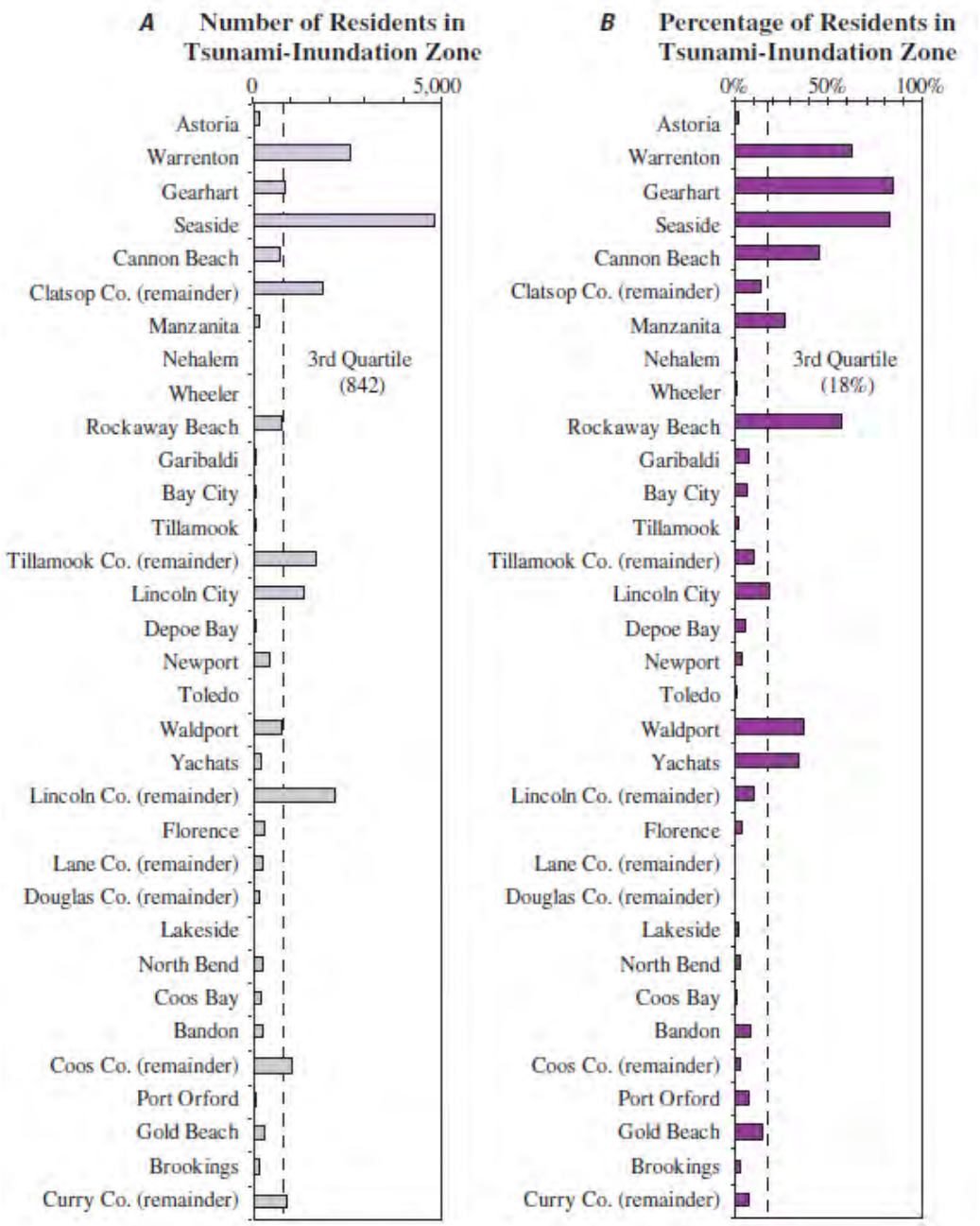

Figure 10. Number (*A*) and percentage (*B*) of residents in the Oregon tsunami-inundation zone.

Figure 13. Oregon Coastal City Populations in the CSZ Tsunami Inundation Zone[298]

[298] Nathan Wood, *Variations in City Exposure and Sensitivity to Tsunami Hazards in Oregon*, Scientific Investigations Report 2007–5283 (Washington, DC: U.S. Geologic Survey, 2007).

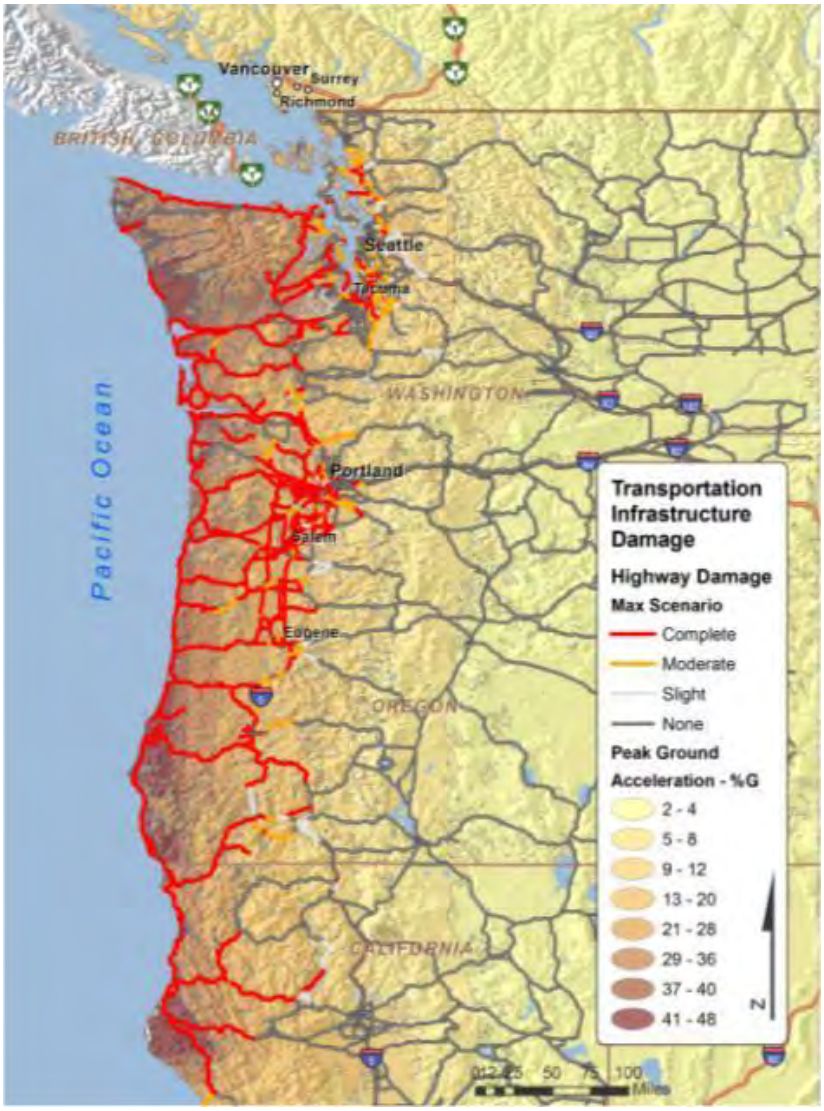

Figure 14. Roadway Damages After a 9.0 Magnitude CSZ Earthquake and Tsunami[299]

3. Planned CSZ Response and Recovery

The State of Oregon has developed, along with FEMA Region X, a response plan for a CSZ event. The mission of the response plans are to provide lifesaving and life-sustaining assistance and resources necessary to supplement local, regional, tribal, and private-sector efforts immediately following a catastrophic CSZ earthquake and tsunami

[299] U.S. Department of Homeland Security, Homeland Infrastructure Threat and Risk Analysis Center, *Draft Analytical Baseline Study for the Cascadia Earthquake and Tsunami*.

to alleviate the dire impacts of the incident and encourage the recovery of the affected areas.[300]

The plans are modeled on the threat posed by a magnitude 9.0 CSZ earthquake and resultant tsunami. The scenario for this incident was developed using FEMA's HAZUS—MH loss estimation program. Specific analytical information was provided by the National Infrastructure Simulation and Analysis Center (NISAC), and the Homeland Infrastructure Threat and Risk Analysis Center Office of Infrastructure Protection National Protection and Programs Directorate (HITRAC), which are contained in the Draft Analytical Baseline Study for the Cascadia earthquake and tsunami.

Key tasks based on the devastation of the event are to do the following:

- unsure/protect responder and public health and safety, and to save and sustain life
- stabilize the situation
- provide for basic human needs to include food, water, shelter, and emergency medical care and services
- minimize damage to and protect property
- restore and stabilize critical infrastructure and key resources
- support reentry, repopulation, long-term recovery, and future hazard mitigation

Response planning assumes that an earthquake of this scale would quickly exceed state and local resources. It is anticipated that a significant amount of external resources will be required for a disaster response. Oregon will immediately request support from FEMA, and in the absence of communications, immediate lifesaving support will be sent to forward staging areas on the Oregon coast.[301]

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[300] Oregon Office of Emergency Management, *State of Oregon Cascadia Subduction Zone Catastrophic Earthquake and Tsunami Operations Plan*.

[301] Ibid.

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V. FINDINGS

A. ANSWERING THE QUESTION: HOW CAN THE GEOPOLITICAL, PHYSICAL, ECONOMIC, SOCIAL, AND PSYCHOLOGICAL FACTORS IDENTIFIED IN THE CASE STUDIES IMPACT THE RECONSTRUCTION OF SEASIDE, OREGON?

1. L' AQUILA, ITALY

a. Economic Impacts and Financial Support for Recovery—Findings

The economic impact to Oregon is estimated to be in excess of $32 billion dollars.[302] Planning assumptions of the federal and Oregon CSZ response plans are that at the time of the modeled earthquake, no other major disasters are occurring in the United States and that response will be immediate and heavy to support Oregon, Washington, and California.[303] A large-scale federal response would be similar to the L'Aquila experience, as local and state government responses would be impacted severely. It is likely that, similar to L'Aquila, ample financial support will be available to conduct response and recovery operations.

Long-term recovery in Oregon may also stagnate due to reduced tax revenue, evacuation of the population workers to areas with safety, and better job outlooks.[304] Outmigration of workers and families will likely impact severely the recovery of businesses and reduce the tax base of local government when it is most needed. The fact that Clatsop County (in which Seaside is located) already has a higher percentage of persons living below the poverty line than the national average[305] creates additional

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[302] Cascade Region Earthquake Workgroup (CREW), *Cascadia Subduction Zone Earthquakes: A Magnitude 9.0 Earthquake Scenario* (Cascadia Region Geology and Emergency Management Agencies: Cascade Region Earthquake Workgroup (CREW), 2013).

[303] Federal Emergency Management Agency (FEMA) Region X, *Cascadia Subduction Zone (CSZ) Catastrophic Earthquake and Tsunami Response Plan*, 8–9.

[304] Alexander, "Models of Social Vulnerability to Disasters."

[305] U.S. Census Bureau, "State and County Quickfacts—Clatsop County, Oregon," January 6, 2014, http://quickfacts.census.gov/qfd/states/41/41007.html.

concerns for recovery due to research that the poor are far less likely to recover from a catastrophic disaster and are more likely to relocate.[306]

Despite the tremendous economic damages of the earthquake, large federal response and recovery assistance is both planned for and expected. The challenge will be in the ability of Seaside to utilize this injection of assistance to accommodate and employ surviving citizens in economic activities that will reap benefits beyond the reconstruction phase. It is critical that local and state governments work with existing businesses and employers to develop business continuity protocols and contingency plans to ensure that business and industry vital to the recovery and beyond are able to continue. Pre-earthquake economic development is crucial along the Oregon coast to combat the identified issues of poverty and relocation of citizens.

b. Natural Barriers to Recovery—Findings

Due to the population density and infrastructure of Central Italy, it is hard to compare this event with coastal Oregon. One similarity that would likely appear was noted in the description of the mountainous geography of Central Italy that gave a sense of distance, and with it, the psychological issues of separation that would not have been as apparent in flatter terrain. Evacuee adults who have lost their homes were especially vulnerable to a sense of abandonment and disorientation due to the loss of community.[307] Coastal Oregon is much more rural and isolated. Access to the coast from the Willamette Valley is only through seven two-lane highways that cross the Coast Mountain range. All these highways are expected to have major damage, which would limit access to and from the coast.[308] It is plausible that Oregon evacuees will have similar if not worse isolation and fears of abandonment as Italians had.

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[306] Rozario, "Rising from the Ruins"; Glasmeier, interview by Peter Dizikes, "3 Questions: Amy Glasmeier on Rebuilding After Disaster Hits."

[307] Alexander, "An Evaluation of Medium-Term Recovery Processes After the 6 April 2009 Earthquake in L'Aquila, Central Italy," 60–73.

[308] Oregon Department of Transportation Bridge Engineering Section, *Seismic Vulnerability of Oregon State Highway Bridges*.

The size and wildness of the Oregon coastline coupled with the severity of the modeled CSZ earthquake, roadway loss, and isolation can be expected. Continuation of coastal roadway improvements and bridge seismic retrofitting projects currently being done by the State of Oregon are needed, along with roadway "lifeline" planning that identifies vulnerabilities and likely needs of Oregon roadways. Work in reception communities for coastal evacuees to ensure social networks are maintained and evacuated citizens are kept informed of the status of the response and recovery in their communities is also needed. A positive lesson to be learned from L'Aquila is that the distance from abandoned homes had less of an impact on children due to the artificial social structure of schools and routine established in the evacuation areas. Ensuring that all evacuated persons have a structure and routine to focus on will be helpful.

c. Land Use and Mitigation Planning Recovery Issues—Findings

The construction of large-scale housing complexes akin to the CASE project in L'Aquila is unlikely due to the topography and population size of the Oregon coast. Issues arising in the CASE projects should be addressed to avoid similar issues.

The CASE project was built in environmentally sensitive areas with sanitation unable to handle the population size. The American practice of using temporary shelters, such as trailers and "Katrina Cottage" type small pre-fabricated housing units (Figure 15), would spread the footprint of temporary housing locations over a bigger area.

Figure 15. "Katrina Cottage" Temporary Housing in the Lower 9th Ward of New Orleans[309]

Figure 16. CASE Housing Unit at Bazzano, Outside of L'Aquila[310]

309 *Wikipedia*, s.v. "Katrina Cottage," last modified April 3, 2013, http://en.wikipedia.org/wiki/Katrina_Cottage.

310 Alexander, "Models of Social Vulnerability to Disasters."

The CASE projects also failed to provide standard amenities to evacuees, such as government assistance offices, commercial activities, and medical offices. The projects were built far from the evacuated city with limited means to travel to locations for these services. In the wake of a CSZ earthquake and tsunami, the ability to reach areas not impacted by the event would be even greater. Most cities on the coast would face similar hardships as Seaside, and the ability to reach larger cities identified as critical areas of support (Astoria is the nearest to Seaside, 16.4 miles away) would be severely impacted due to roadway damage. Critical coastal roadways will be severed for months until repaired.

Italy's regional risk reduction and natural hazard mitigation policies were inadequate for L'Aquila and many other communities throughout the country. Below the regional governments, only a small number of Italian municipalities have comprehensive disaster reduction (mitigation) plans.[311]

A recent mitigation initiative in Seaside, a local bond measure looking to construct a new school above the tsunami inundation zone and built to more stringent building codes to also serve as a long-term community shelter, was defeated severely (62% to 38%) in the 2013 election.[312]

Recovery planning on the catastrophic scale has not occurred at the local state or federal level. In a 2013 audit of the Oregon Office of Emergency Management, the Oregon Secretary of State's office found that the state does not have a formal Relief and Recovery Plan; without a complete plan, the state's recovery from a major disaster could be delayed and less effective.[313] Due to the catastrophic events of a CSZ earthquake, the effectiveness of local government in Seaside (and in Clatsop County) is likely to be severely diminished. With the State of Oregon's recovery efforts to date lacking, and

[311] Alexander, "An Evaluation of Medium-Term Recovery Processes After the 6 April 2009 Earthquake in L'Aquila, Central Italy," 60–73.

[312] Louie Opatz, "Precinct By Precinct, Bond Measure Took Beating," *The Daily Astorian*, November 23, 2013, http://m.dailyastorian.com/mobile/your_town/cannon_beach/precinct-by-precinct-bond-measure-took-beating/article_651fa53e-542c-11e3-9e3e-0019bb2963f4.html.

[313] Oregon Secretary of State, "Office of Emergency Management: Rebuilding the Organization to Strengthen Oregon's Emergency Management," February 2014, http://sos.oregon.gov/audits/.

local governments having the inability to function due to the event, it would fall on the federal government and outside assistance to lead much of the recovery efforts. Based off the L'Aquila experience, this scenario is an issue for coastal Oregon and the City of Seaside that needs to be addressed with effective recovery planning and pre-defined visions on what the future of the city is to look like.

Recovery planning for temporary housing locations on the coast (and elsewhere in the state as transportation damages are expected throughout the I-5 corridor) needs to address amenities and survivor needs in nearby locations, and should occur as recovery plans at the local, state, and federal level are developed for this scenario.

Due to the terrain of the Oregon coast, construction would likely be forced to occur on environmentally sensitive and zoning restricted properties (farm and forest zoned property, hillsides, etc.). At the present, no uniform land use planning protocols exist for establishing temporary housing or survivor encampments. Haphazard, unsafe, and unsanitary development may occur without these provisions in local and state land use planning requirements. Like Italy, conflict could occur in the absence of a comprehensive recovery plan.[314]

Financial support for community investments in education and safety will need to occur to enable these protective measures to be made. As evidenced by the bond measure defeat, financial assistance for public building improvements and shelters in safe areas will need to come from outside sources, or the local population will need to recognize the need to pay for these upgrades.

Oregon has natural hazard disaster mitigation planning in all 36 counties and has worked to secure funding for federal and state pre-disaster mitigation projects. This effort will need to continue, or be enhanced. It would be politically difficult, but prioritization for coastal projects may be required. Every effort should be expended to ensure that funding for natural hazard mitigation planning and mitigation continue to lessen the impact of this future event.

[314] Alexander, "An Evaluation of Medium-Term Recovery Processes After the 6 April 2009 Earthquake in L'Aquila, Central Italy," 60–73.

Pre-event recovery planning also needs to involve local residents and a mechanism created to involve surviving local residents formally in the recovery process after the earthquake.

d. The Social and Psychological Stresses of the Loss of Community—Findings

As described in other sections of this research, the involvement of the L'Aquila local populace in recovery and restoration of their community was very limited, and had a negative impact on the community's social structure and well-being of survivors.

High levels of psychological distress were found in 65.6% of the residents studied.[315] In the transitional shelter that followed the hotel and tent phase, domestic violence, substance abuse, and other social pathologies increased significantly.[316] In the transitional housing developments, other social and psychological consequences resulted from the lack of attention to social structure and networks. Residents had an enhanced sense of "isolation, abandonment and powerlessness."[317]

An analysis on what social structure is important to Seaside's citizens and determinations on how to incorporate those needs into pre-event recovery planning both in the community and in likely reception communities at which evacuees would be housed.

e. The Geopolitical and Sociological Need of the Case Study Community to Rebuild—Findings

The research of the L'Aquila experience overwhelmingly points the finger at a lack of inclusion of local requirements, wishes, and citizens as a cause for the recovery challenges and issues since 2009. Corruption investigations of non-local contractors and government officials from outside the area added fuel to the sense L'Aquila's citizens

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[315] Casacchia, Pollice, and Roncone, "The Narrative Epidemiology of L'Aquila 2009 Earthquake," 13–21.

[316] Camillan Task Force, "Studio Rainbow: Storia Naturale dei Disturbi da Stress Postraumatico (PTSD) Nei Bambini Abruzzesi Esposti al Terremoto Dell'aprile 2009."

[317] Alexander, "An Evaluation of Medium-Term Recovery Processes After the 6 April 2009 Earthquake in L'Aquila, Central Italy," 60–73.

feeling that outside groups were ignoring them. Open conflict between the two groups erupted on the streets of L'Aquila and Rome as a result.

When reading the assumptions from the FEMA Region X CSZ Earthquake and Tsunami Response Plan, it appears that "local, state and federal responders will be overwhelmed by the magnitude of the incident" and "regional response resources will be inadequate because of the catastrophic nature of the event and a limited capability to function."[318] State response assumptions echoes this seriousness. "The earthquake and resultant tsunami is so severe that the response capabilities and resources of the local jurisdictions and the state are immediately rendered insufficient, overwhelmed, and exhausted."[319] These assumptions and the planning courses of action written as a result, show that this catastrophic event will require an extremely large (and needed) federal response. The recovery of Oregon will likely be heavily dependent on outside assistance as well.

The United States does not have the stereotypical corruption levels of Italy; it can be argued that it is worse. As stated in the Transparency International Corruption by Country Index, "Corruption among government and political figures remains a concern. From fraud and embezzlement charges to the failure to uphold ethical standards, there are multiple cases of corruption at the federal, state and local level. Money laundering convictions and ethics violations by U.S. Congress representatives has also furthered citizen distrust."[320] The United States is ranked 19 (with a score of zero being very corrupt and 100 being very clean) in the list of government corruption, with Italy having a ranking of 69. The data in Italy's ranking likely reflected a bill introduced after the Berlusconi administration left power by previous Italian Prime Minister Mario Monte calling for greater accountability and transparency in Italian politics and government by

[318] Federal Emergency Management Agency (FEMA) Region X, *Cascadia Subduction Zone (CSZ) Catastrophic Earthquake and Tsunami Response Plan*, 8–9.

[319] Oregon Office of Emergency Management, *State of Oregon Cascadia Subduction Zone Catastrophic Earthquake and Tsunami Operations Plan*.

[320] Transparency International, "Corruption by Country," January 26, 2014, http://www.transparency.org/country#USA_Chapter.

establishing, among others, an anti-corruption agency and introducing whistleblower protection in the public sector.[321]

It would serve Seaside and other Oregon communities to plan proactively for recovery, and local governments and surviving citizens' roles in it. This planning will likely prove extremely valuable and convey pre-event to locals and outsiders that the recovery of Seaside will be pre-designed and pre-planned based on Seaside's priorities. More importantly, based on the stresses and challenges suffered by L'Aquila, Seaside will be recovered by its citizens, even in the aftermath.

While Oregon-specific data on corruption was not located for this study, and therefore an unknown issue, it would still be beneficial to establish, along with long-term recovery planning, an established contracting system pre-event. A transparent view of pre-identified contractors could be useful in exposing post-event corruption. Social media is monitored and used heavily in the response phase of natural disasters; in L'Aquila, it galvanized opposition to recovery problems in the city. By utilizing social media to monitor recovery and provide information to citizens in real-time, it would allow the recovery to be more transparent and open to citizen inputs. FEMA has begun to promote the use of social media through trainings, such as instructor led courses like PER-304—Social Media for Natural Disaster Response and Recovery.

2. WATSONVILLE, CALIFORNIA

a. Economic Impacts and Financial Support for Recovery—Findings

The Watsonville experience showed the vulnerabilities of and the need to support low-income and vulnerable populations. It was determined that pre-event outreach to rental tenants, low-income residents, non-English speaking residents, and tourists would pay dividends in the chaos after the earthquake. Identifying and educating residents of potential post-event economic assistance and requirements to receive it would be useful in low-income populations.

[321] Transparency International, "Corruption by Country," January 26, 2014, http://www.transparency.org/country#USA_Chapter.

While Seaside does not currently have the large Spanish-speaking immigrant population that Watsonville has, their population continues to grow in Seaside. Seaside had a higher percentage of low-income residents in 2010 (17.7%)[322] than Watsonville had prior to the Loma Prieta earthquake in 1989 (15.3%).[323] The heavy tourist transient population may skew these numbers on any given day. Establishing multi-lingual outreach regarding disaster preparedness but also information on post-disaster economic assistance protocols could make the transition to recovery easier for these populations.

A lesson from Watsonville was in the flexibility of housing programs to accommodate the population. By relaxing the standards to prove residency, it was possible to move survivors from temporary shelter to transitional housing. The small-scale grant program instituted by Watsonville was also effective in getting needed financing to people rapidly. Seaside and the State of Oregon should, as a part of recovery planning efforts, look at the pre-establishment of these sorts of programs that can smooth recovery and speed reconstruction.

The passage of a post-disaster tax measure focused on recovery helped Watsonville generate a large amount of money that could be utilized on local recovery actions not tied to federal of state restrictions. Based on the large-scale destruction and disruption after a CSZ earthquake and tsunami, it is uncertain whether a post-disaster tax for recovery would have much impact. A 2013 measure to construct a new K-12 school located outside of the tsunami inundation area was significantly defeated.[324] Future pre-event tax measures for earthquake resilience and recovery could also face a difficult path to implementation.

b. Natural Barriers to Recovery—Findings

Watsonville does not have the natural barriers that could limit recovery that the Oregon Coast has. Similar to Oregon's statewide land use planning system, planning in

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322 U.S. Census Bureau, "State and County Quickfacts-Seaside (City) Oregon."

323 U.S. Department of Housing and Urban Development, "SOCDS Census Data: Output for Watsonville City, CA," April 18, 2014. http://socds.huduser.org/Census/incpov.odb?msacitylist=7485.0*0600083668*1.0&metro=msa.

324 Opatz, "Precinct By Precinct, Bond Measure Took Beating."

1989 Watsonville was geared to contain urban growth and preserve farmland. As described by O'Toole, these smart growth policies created to reduce the spread of low density urban development creates an artificial land and housing shortage.[325] Watsonville's housing shortage became apparent as it struggled to place temporary housing within its city. The simplification of the land use planning process, and allowing non-conforming land uses and increased housing densities was needed to meet housing needs. With the majority of Seaside's urban growth boundary (UGB) expected to be inundated by a CSZ tsunami, local, county, and state land use planning will need to develop policies and criteria to identify locations currently zoned for farm or forest uses outside of the UGB that could be used for temporary urban recovery locations (shelters, mass care sites, temporary housing, etc.). Ideally, and where possible, this post-disaster land use recovery planning would coincide with an active effort by local, county, and state land use and emergency management planners to move housing and critical urban services to more resilient areas outside of the inundation area. The City of Seaside Planning Department was not willing to provide a copy of the current zoning and comprehensive plan maps for this research due to their current revision. Analysis of current planning designations and zoning restrictions would be beneficial to determine ideal post-disaster areas best suited to guide future housing and infrastructure to more resilient areas.

c. Land Use and Mitigation Planning Recovery Issues—Findings

In addition to adapting post-disaster planning to smart growth practices in an ad-hoc manner, Watsonville was reasonably successful in simplifying recovery-planning efforts on pushing repair and reconstruction permits through the system. Focusing efforts on building inspections, the end state of the building process, sped reconstruction efforts. A lesson learned from Watsonville and Santa Cruz County after the 1989 earthquake was that development of post-disaster permitting procedures is crucial. Local governments may lack the ability to conduct planning and building permitting "normally" after a disaster event; for Seaside, the catastrophic CSZ scenario will undoubtedly eliminate any

[325] Randal O'Toole, "Population Growth and Cities," *The Electronic Journal of Sustainable Development* 1, no. 3 (2009): 97–104.

semblance of "normal" for the city. As described earlier, pre-event decisions with citizen involvement based off modeled impacts on how non-conforming uses and re-zoning of properties in the aftermath needs to occur to limit conflicts and obtain community buy-in. As described in the L'Aquila case study, and in other locations of this research, it is crucial to involve the citizenry in the design phase.

d. The Social and Psychological Stresses of the Loss of Community—Findings

The small-town work ethic of Watsonville was evident in a quote noted by Eadie that "the fact that people knew each other by their first names made it easier for people to be concerned with more than their own interests."[326] As described in the Valdez, Alaska, case study, this work ethic appears to be a trend in smaller heterogeneous (as relating to the Spanish-speaking immigrant population in Watsonville) communities. This observation, if indeed true, bodes well for the smaller, rural areas of the Oregon coast, including the City of Seaside. The Oregon coast, and particularly communities in Lincoln and Clatsop Counties, have stepped up citizen preparedness and involvement in preparations for a CSZ earthquake. Volunteerism is high amongst Oregonians (34.1% in 2012).[327] The Oregon coast is aware of the risk, and is producing and expanding planning to deal with the event, and possesses an active citizenry focused on preparedness.[328] These volunteer efforts, along with a sense of community, will conceivably have benefits similar to those experienced as Watsonville rallied to recover.

Another lesson of the Watsonville experience is that local government needs to be prepared to face new political realities post-disaster and embrace the efforts of local committees. As seen in L'Aquila, and described in the research done by Bartlett, Quarantelli, and Dynes, and Kunreuther and Fiore, showed connections between local involvement and social and psychological recovery following disaster. As recovery

[326] Eadie, "Earthquake Case Study: Loma Prieta in Santa Cruz and Watsonville, California," 281–310.

[327] Corporation for National and Community Service, "Volunteering and Civic Engagement in Oregon," accessed April 21, 2014, http://www.volunteeringinamerica.gov/OR.

[328] Federal Emergency Management Agency, "Citizen Corps."

planning for the post-disaster realities of Seaside begins, it needs to involve the community and ensure that involvement continues.

As Watsonville discovered, Seaside should take heed of the need to respect the sheltering decisions of the population. Watsonville's impromptu tent cities originally were going to be closed by the county, which was afraid of unhealthy conditions. After discovering the sociological (keeping social networks intact) and psychological benefits (fear of past experiences in the Mexico City earthquake) the camps offered, they worked with the community on mutually agreeable solutions for temporary sheltering. With the large-scale devastation and isolation of Oregon coastal communities, many types of shelters will likely be established. It is imperative that the population's health and safety be maintained while respecting community needs during a very difficult time. Community and neighborhood groups in Seaside and elsewhere should work with emergency planners to discuss these needs in development of response and recovery plans. Including diverse groups in sheltering and disaster housing would help solve post-disaster issues described by Haas and others as "overlooking people and their problems is tantamount to increasing the effects of disaster"[329]

e. The Geopolitical and Sociological Need of the Case Study Community to Rebuild—Findings

Studies have shown that perceived differences in the quality of response and recovery actions based on ethnic lines led to feelings of distrust and injustice. Language and cultural differences added to challenges faced by responders and the community. The impact of poverty added to the challenge of rebuilding the city. The University of Colorado at Boulder Natural Hazards Center has indicated that the plight of these communities needs to be lessened through consistency, sincerity, and following through on promises.[330] Ensuring transparency and disadvantaged populations informed of recovery actions and methods of getting help is critical. Prior to the earthquake, the City of Seaside, Clatsop County and the State of Oregon should establish networks within

[329] Haas, Kates, and Bowden, *Reconstruction Following Disaster*.

[330] Natural Hazards Center, *Holistic Disaster Recovery Ideas for Building Local Sustainability after a Natural Disaster*.

disadvantaged populations to develop trust and awareness. Following up on already produced bilingual disaster outreach materials with hands on community meetings and social networking in the communities will lessen tensions based on the Watsonville experience.

Prior to the earthquake, Watsonville was already experiencing political challenges that were only exacerbated following the event when elections were delayed. Seaside and other communities as a part of Continuation of Operations/Continuity of Government (COOP/COG) planning should plan for solutions and protocols to maintain civic elections and community based advisory groups. Citizen committees in Watsonville served as a conduit for communication on housing and commercial reconstruction needs. Seaside should continue to facilitate the involvement of neighborhood groups and should also take a continued active advisory role in response and recovery planning as it has in helping neighborhoods and citizens develop tsunami supply caches and other outreach programs.[331] This outreach should dovetail with increased efforts previously discussed to assist low income, non-English speaking, tourist populations, and the immigrant population in promoting not only pre-event preparation information, but incorporating post-event assistance and recovery information, such as bilingual or clearly identifiable and understood emergency signage, building assessments, and assistance information.

Wide-scale infrastructure damage on the Oregon coast will create isolated pockets of survivors in Clatsop County. As Watsonville recognized the impromptu shelters created to preserve social bonds, Seaside and other communities should plan and prepare for dealing with a population unable or unwilling to move to official sheltering locations, as well as include an analysis of likely isolated pockets of population and their immediate lifesaving needs and difficulties in initiating early recovery.

Lastly, the Justice Department ruling calling for increased community groups in the recovery planning process has provided, statewide in California, a method for dealing with the post-disaster and recovery needs of vulnerable minority and low-income populations. As Oregon state and local CSZ planning moves into considering recovery

[331] City of Seaside, "Earthquake and Tsunami Preparedness," accessed April 21, 2014, http://www.cityofseaside.us/emergency-preparedness/earthquake-and-tsunami-preparedness.

issues, it would be beneficial for Seaside and the rest of the state to take heed of the negative experience of L'Aquila Italy previously described, and that of Watsonville, which has relatively positive post-earthquake experiences with community involvement in recovery.

3. VALDEZ, ALASKA

a. Economic Impacts and Financial Support for Recovery—Findings

The 1964 Alaskan earthquake and tsunami is a very similar event physically, geographically, and comparatively with regard to Oregon coastal communities and a CSZ event. As described, Valdez was damaged to the point that relocation was the only acceptable solution to recovery in the community. Economic losses were extremely large following the Alaskan earthquake, if the established models are correct, a CSZ earthquake and tsunami is estimated to cause $32 billion in Oregon alone,[332] with region-wide damages exceeding $70 billion.[333]

The economic support for response and recovery for Alaska was large, in particular for cities outside of the Anchorage metropolitan area, such as Valdez, which is likely primarily for the geopolitical and isolation issues discussed. With the extent of the disaster, it is likely that without large federal aid, recovery in Alaska would have languished or failed altogether. With the natural resources of Alaska and the state's geostrategic importance, allowing Alaska to fail was not an option for the United States.

Seaside may face a similar fate to Old Valdez. Much of the city is likely to be destroyed. Recovery and reconstruction will likely require changes to the city's boundaries for safety and hazard mitigation reasons. After a CSZ earthquake, it is likely that the majority of aid and assistance will flow to Portland and larger cities in the Willamette Valley. The Alaskan experience, to include the reconstruction of Valdez,

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[332] Oregon Seismic Safety Policy Advisory Commission, *The Oregon Resilience Plan—Cascadia: Oregon's Greatest Natural Threat*, 1.

[333] U.S. Department of Homeland Security, Homeland Infrastructure Threat and Risk Analysis Center, *Draft Analytical Baseline Study for the Cascadia Earthquake and Tsunami*.

showed that effective responses of rural and isolated areas depended on the large influx of federal disaster assistance and monies for reconstruction.

The SBA decision in Alaska to permit loans for homeowners and businesses looking to modernize instead of only replacing damaged was fundamental in the recovery and modernization of rural Alaskan communities, and was extremely beneficial in moving Valdez to its new location. Valdez was able to capitalize on the damages by modernizing a town described as "shabby"[334] with modern structures and infrastructure capable of supporting the community's future growth. In Seaside, a vacation destination with a large number of vacation and rental homes, a key change to the current SBA policies that could benefit community recovery is allowing for loans to rebuild second homes. The current policies of not allowing loans for second homes have impacted the recovery of beach towns recovering from Hurricane Sandy.[335] The financial burdens of rebuilding a second home could conceivably have an impact on recovery in cities throughout earthquake-damaged Oregon, as homeowners struggle to cover losses in their primary and secondary homes.

Additionally, the use of SBA loans to retire debt enabled Alaskans to emerge from the disaster with less debt burden than they would have, which reduced bankruptcies and foreclosures in the years following the earthquake. Having a clear vision of requirements and possibilities with disaster loans would enable homeowners and businesses to better envision their financial parameters if their homes and/or businesses were lost. This recommendation goes along with the recommendation for pre-planning in the realities of the post-earthquake Oregon Coast. Along with this pre-planning, it would behoove planners to envision the long-term economic trajectory the city would have after the earthquake. Much like Valdez was able to diversify its economy by increasing tourism opportunities, incorporating post-disaster commercial and industrial projections to comprehensive planning would enable the city to act on opportunities more effectively.

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[334] National Research Council, *The Great Alaska Earthquake of 1964, Human Ecology.*

[335] Eugene Palk, "Left Out of Federal Sandy Relief, Owners of Second Homes Hope for Help," *NJ.com*, May 19, 2013, http://www.nj.com/ocean/index.ssf/2013/05/left_out_of_federal_sandy_relief_owners_of_second_homes_hope_for_help.html.

b. Natural Barriers to Recovery—Findings

The physical impacts of the 1964 Good Friday Alaskan earthquake and tsunami, along with the isolation of the area, make this case study the most analogous to a CSZ event along the Oregon coast. Modeled and anticipated infrastructure damage of a CSZ earthquake would make Seaside and the rest of the Oregon coast extremely hard to reach, which would prolong response and delay recovery. Unlike coastal Oregon (based on CSZ modeling), Valdez was able to obtain support (and facilitate post-disaster migration) via the Richardson Highway. Adding to the difficulty is the fact that the Alaskan population is only 1/5 that of Oregon,[336] which does add to the complexity of supporting response and recovery.

Alaska's process of expediting building permits allowed for reconstruction to occur rapidly. Oregon does not have the same sort of extremes in seasonal construction, but the seasonally wet winters on the Oregon coast do require construction to proceed at an expedited rate. By establishing city, county, and state disaster building permit protocols before the earthquake, coupled with disaster land use planning and disaster mitigation standards previously discussed in the Watsonville, California, lessons learned, Seaside could theoretically be prepared to issue permits quickly following a catastrophic disaster.

c. Land Use and Mitigation Planning Recovery Issues—Findings

Like other case studies in this research, the necessity of streamlining land use permitting and issuing of building permits was shown to be effective in the relocation of the City of Valdez. It enabled construction to occur within the shortened building season and with increased mitigation construction measures. Seaside would be well served to have procedures established pre-event on the issuance of (re)building permits and the land use and zoning requirements needed for construction to occur. The designs of these procedures and land use criteria will need to include and not sacrifice the likely mitigation and modern seismic safety standards required of new construction. In Valdez's

[336] U.S. Census Bureau, "Statistical Abstract of the United States, 2012," October 11, 2011, https://www.census.gov/prod/www/statistical_abstract.html#.

case, it can allow a city to react positively to new planning guidance and infrastructure allowing for reconstruction to be safer and better designed to meet civic challenges.

As development planning for the new town site occurred, Valdez kept its residents aware and involved through the use of citizen committees and open meetings. It appears that this citizen involvement aided in the rapid relocation of the city (three years). Following the lessons of Valdez, it is likely that inclusive post-disaster planning and design of the City of Seaside will require the involvement of the whole community to be successful.

Valdez is experiencing a rebirth of interest in establishing new uses for the Old Valdez town site as the city grows and memories of the 1964 event are less current. As restrictions on building in the old city site expire, interest in development is becoming more frequent. Valdez is developing a land use plan for the old city, which limits development in the most dangerous locations. Pre-event planning done by the City of Seaside should consider the future uses of areas of the city that may be abandoned as the city recovers. Revision of plans and ordinances (Periodic Review) for a city the size of Seaside is required every 5–15 years according to the State Department of Land Use Conservation and Development and required by Senate Bill 543, passed in 1999.[337] Periodic review and the involvement of the community in charting the parameters of reconstruction in Seaside post-event are vital for both the city and its citizens.

d. The Social and Psychological Stresses of the Loss of Community—Findings

"Alaskans will want to be helpful. Volunteers and those offering services for pay will come forward. They will need resourceful leadership…Alaskans will not riot, take unlawful advantage of those victimized, or tolerate those who attempt such behavior."[338] These statements from the current Alaskan emergency operations plan were true in 1964 Valdez at the time of the earthquake. While it is likely and hopeful to assume that the

[337] Ken S. Calbick, "The Use of Program Theory for Identifying and Evaluating "Best Practices" for Implementing Land-Use Policies" (master's thesis, Simon Frasier University, 2003).

[338] State of Alaska, Division of Homeland Security and Emergency Management, *State of Alaska Emergency Operations Plan*, 7.

altruism of 1964 Alaska will play out on the Oregon coast, pre-identified post-disaster planning for recovery and socio-economic resilience will be crucial to assuring that social order and a spirit to rebuild flourishes after the disaster.

The researched economic coordination of Alaskan businesses to support a needy population following the earthquake is a testament to this altruism. Mechanisms in place to coordinate costs of essential services for both residents and businesses would be helpful for both groups to plan effectively for the post-earthquake financial and resource shortage realities. Granted, it is difficult to gauge future economic costs and supplies; however, enabling a dialogue between the city, community groups and businesses could support long-term recovery by implementing a mechanism to allow for a distribution of needed scarce resources while allowing businesses to return with some assurances of survivability.

A potential issue for Seaside as response transitions to recovery is the long-term evacuation of its citizens. Past events, such as Hurricane Katrina and L'Aquila Italy, have shown that extended time in evacuation areas led to a sense of abandonment in evacuees leading to a lagging recovery of those cities. The large federal investment in recovery following the 1964 earthquake allowed Valdez to avoid this fate, presumably by showing residents that their plight was being addressed with vigor. Efforts by state and local governments to speed post-disaster planning and permitting recognized the need to recover quickly and return to normal. While unintentional, it is conceivable that these actions provided hope to residents who stayed to rebuild and evacuees.

Lastly, despite recent outreach and planning regarding the severity of a CSZ earthquake and tsunami, and the challenges coastal residents likely will face in the aftermath, research is available that describes a malaise that comes from a lack of disaster experience. With Oregon having typically fewer presidentially declared disasters than many parts of the nation (see Figures 17 and 18), Oregonian and Seaside residents have not experienced recent disasters. In describing "disaster subcultures," Tierney explains that recent disaster experience leads to the exchange of knowledge and preparations based on community experiences. Perception of danger is greater and reaction to disasters

is swifter and better prepared for in communities that have experienced disaster in recent memory.[339]

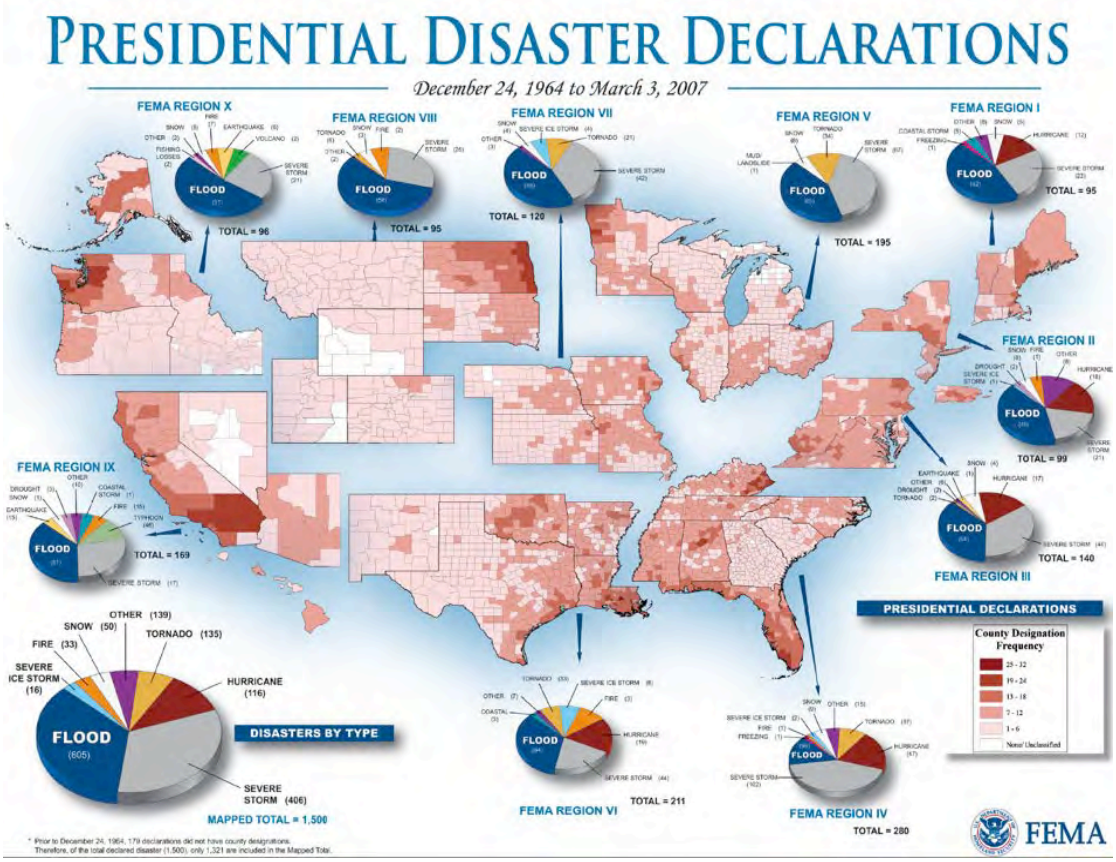

Figure 17. Presidential Disaster Declarations 1964–2007[340]

[339] Kathleen J. Tierney, "The Social and Community Contexts of Disaster," in *Psychosocial Aspects of Disaster*, ed. R. M. Gist and B. Lubin (New York, NY: John Wiley and Sons, 1989), 11–39.

[340] Federal Emergency Management Agency, "Presidential Disaster Declarations, December 24, 1964–March 3, 2007," 2013, http://www.fema.gov/pdf/hazard/map/declarationsmap1964_07.pdf.

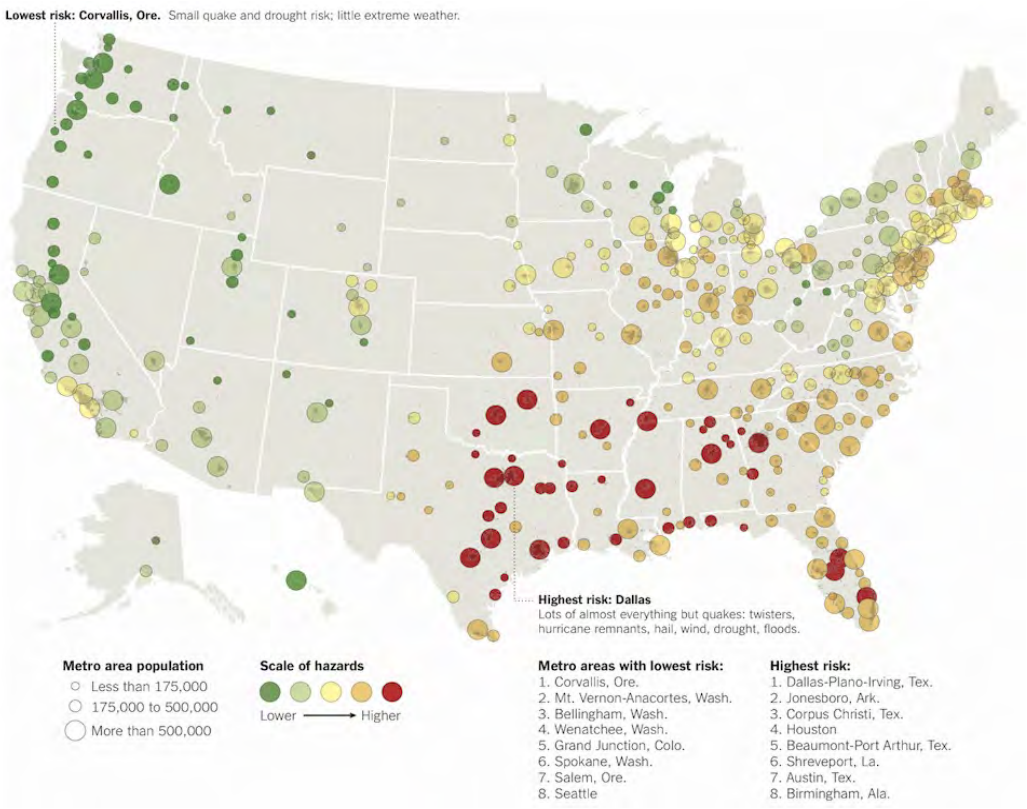

Figure 18. Disaster Risk of United States Metropolitan Locations[341]

With the last CSZ earthquake and tsunami occurring in 1700, before European settlement, no useful first-hand historical legacy is available to be passed along by a "disaster subculture." Outside of smaller disasters occurring more frequently, continued earthquake and tsunami outreach, preparedness events, education of residents, and other awareness activities, are really the only solution for Seaside to prepare for and educate its residents. Determining how to avoid the loss of awareness, described in the proposed developments in the Old Valdez town site, will be critical for future residents of Seaside and the Northwest as time passes after the next CSZ earthquake and tsunami.

e. The Geopolitical and Sociological Need of the Case Study Community to Rebuild—Findings

For a community to be economically sustainable and geopolitically important to the nation as a whole, it helps to have critical industry, strategic value, or a role in the

[341] New York Times, "Where to Live to Avoid a Natural Disaster."

expansion of the American economy. The Oregon coast, including the City of Seaside, does not have the same geopolitical or economic significance as Alaska, especially as it did in 1964, in the midst of the Cold War. This perceived lack of economic and geopolitical value for the United States of the Oregon coast could have an impact on American taxpayers footing the bill for recovery and on Oregon communities economically struggling to recover. The proposed economic development of liquefied natural gas (LNG) export terminals on the Oregon coast, currently proposed for Coos Bay and Warrenton (12.5 miles north of Seaside),[342] could improve the economic prestige of the Oregon coast, and perhaps, increase recovery aid to the area following a CSZ earthquake. The assumption of this suggestion is that the LNG terminals would be built to seismic standards and resilient to tsunami and earthquake hazards as determined by geotechnical assessments by coastal counties.[343]

Another important strategic geographic significance of Seaside and the northern Oregon coast is the proximity to the Columbia River. In the short term, with the CSZ event limiting navigation from the sea, availability of emergency supplies to the larger cities of Portland and Astoria will be reduced. In the long term, exports of energy and agricultural products from the Dakotas westward will be impacted, which will result in an extreme financial impact and force alternate routing to ports outside of the impact zone at greater cost. The economic importance of the Columbia River is immense to the nation. The river enables $20 billion of commerce, with over 42 million tons being shipped annually.[344] It serves as the conduit for 40% of U.S. wheat exports.[345] Columbia River shipping directly employs 40,000 people in addition to many jobs created by related industries. Barging on the river is a more cost effective, fuel-efficient, and environmentally cleaner way to export goods from eastern Oregon and Washington, and

[342] Oregon Department of Energy, "LNG in Oregon," accessed April 24, 2014, http://www.oregon.gov/energy/pages/lng.aspx.

[343] CH2MHill, *Site-Specific Seismic Hazard Evaluation for the Oregon LNG Import Terminal Appendix I.1 to Resource Report 13* (Warrenton, OR: LNG Development Company, LLC (d/b/a Oregon LNG), 2008).

[344] Pacific Northwest Waterways Association, *Columbia Snake River Facts* (Portland, OR: Pacific Northwest Waterways Association, 2012), http://www.pnwa.net/new/Articles/CSRSFactSheet.pdf.

[345] Ibid.

the State of Idaho to the Pacific.[346] It should be a national priority to reestablish this important economic conduit for the western United States.

The research revealed that Valdez avoided the problems faced by Italian authorities in L'Aquila by allowing residents access to their damaged homes in the recovery and short-term recovery time periods. This access will not be feasible in many cases, but efforts should be made to ensure that residents, where possible and safely, are able to access their damaged properties. Recognizing the sense of place that survivors have, and needing the opportunity to heal, has been shown to be a requirement of the case studies in this research.

B. RECOMMENDATIONS

1. Steps for Successful Recovery

Successful recovery, the return of the majority of the population, with limited social and psychological trauma enabling a city to return to its pre-disaster functioning, has been shown to coincide with large investments of economic assistance to rebuild. By maintaining mitigation standards and allowing easier processing of permits, communities have been shown to recover more quickly and wholly.

In designing the future for a shattered city, a large segment of the research unveiled that allowing community participation in the planning and design of communities provided needed momentum and consensus to recovery while allowing citizens to recover physically and mentally from the disaster. Successful recovery in the studied case study communities studied showed that facilitating reconstruction planning and permitting quickly and efficiently in the post-disaster environment was a valuable solution. By ensuring that post-disaster reconstruction can occur quickly while not sacrificing hazard mitigation and safety requirements enabled Watsonville and Valdez to recover quicker and more wholly. Immense secondary gains to the rapid processing of reconstruction permitting were gained by trimming red tape in the often adversarial

[346] Pacific Northwest Waterways Association, *Columbia Snake River Facts*.

planning and building permit process, which limited the frustration of survivors already struggling in the new post-disaster landscape.

It has been researched that humans have an established sense of place and social connection to their communities, which provides attachment and satisfaction[347] to their place in the world. To outsiders looking in, this attachment is seen as illogical and costly when it is in direct conflict to catastrophic disasters, such as a CSZ earthquake and tsunami. The case study communities have shown that the sense of place and local citizen's involvement in its reconstruction is key to the recovery of a community and the mental health of its residents. Decisions on the fate of a community, its reconstruction or abandonment, are a local, city block by city block, personal issue. It is not a decision that can be made at a statewide or national level without having serious impacts on survivors of the disaster.

2. Pre-disaster Land Use Planning Is Vital to Post-disaster Recovery

The strongest and intertwined trend in the case study communities was the importance of land use planning in planning for, responding to, and recovering from a disaster. The case studies examined in this research show that land use and urban planning have a critical and extremely understated role in homeland security and disaster recovery. All three communities' post-disaster recovery and reconstruction efforts occurred in an ad-hoc manner; Watsonville and Valdez were able to handle these efforts better than L'Aquila, but all of them had to do it without the benefit of forethought.

Disaster recovery and homeland security are at the center of urban planning goals of communities designed on social cohesion and livable communities. L'Aquila's ultimate failure was that it excluded survivors in the design of recovery, and as a result, recovery languished and survivors fought openly with the local and Italian governments. By ignoring the importance of populations' need to reclaim its community, it set the stage for corruption, stagnation of recovery, and conflict. Watsonville ultimately fared better, but its mistakes were in not understanding the diverse community's needs. Ultimately, it

[347] Jorgenson and Stedman, "A Comparative Analysis of Predictors of Sense of Place Dimensions: Attachment to, Dependence on, and Identification with Lakeshore Properties," 316–327.

was able to adapt and make the right decisions (with the guidance of citizen advisory groups) and avoided the problems of L'Aquila. Valdez had pressures, such as short construction seasons and a national geopolitical need for a strong Alaska to recover quickly. Despite these issues, Valdez still involved its citizens in the design of an entirely new city. This involvement allowed the new city to be built addressing citizen needs.

Based on the case studies and learning from the challenges they faced post-disaster, the conclusion of this research is that land use planning, producing zoning and comprehensive planning of economic, residential and industrial locations in a community, is critical to disaster response, resilience, and recovery. For areas subject to natural disaster, or other homeland security concerns, such as terrorism, land use planning should, pre-event, be more intimately interwoven, planning both for development and reconstruction following disaster with efforts by emergency management organizations dealing with response and recovery planning.

The State of Oregon has a mechanism in place to engage public safety recovery planning through the 19 statewide planning goals (Table 1) developed in 1973 to "express the state's policies on land use and related topics, such as citizen involvement, housing, and natural resources."[348]

[348] Oregon Department of Land Conservation and Development, "Statewide Planning Goals," Accessed May 12, 2014, http://www.oregon.gov/LCD/pages/goals.aspx.

Goal 1 Citizen Involvement	Goal 2 Land Use Planning	Goal 3 Agricultural Lands	Goal 4 Forest Lands	Goal 5 Natural Resources, Scenic and Historic Areas, and Open Spaces
Goal 6 Air, Water and Land Resources Quality	Goal 7 Areas Subject to Natural Hazards	Goal 8 Recreational Needs	Goal 9 Economic Development	Goal 10 Housing
Goal 11 Public Facilities and Services	Goal 12 Transportation	Goal 13 Energy Conservation	Goal 14 Urbanization	Goal 15 Willamette River Greenway
Goal 16 Estuarine Resources	Goal 17 Coastal Shorelands	Goal 18 Beaches and Dunes	Goal 19 Ocean Resources	

Table 1. Nineteen Oregon Statewide Planning Goals[349]

Currently, the only statewide planning goal out of the 19 to address natural disaster is "Goal 7: Areas Subject to Natural Hazard," which requires local governments to adopt comprehensive land use plans to "reduce risk to people and property from natural hazards."[350] Goal 7 requires local governments to evaluate the risk of natural hazards and limit or mitigate development in those identified areas. Goal 7 is highly focused on mitigation, floodplain protection, and the implementation of the National Flood Insurance Program (NFIP), necessary in a state with the rainfall that Oregon receives, but Goal 7 does not address recovery from catastrophic disaster and it does not address planning for future impacts to the city boundaries and location of a devastated community. Coordination with emergency management planners and local citizen groups could be important measures to address some of the pre-event land use and recovery planning that the case study communities were forced to address after the event. The 19 statewide planning goals have citizen involvement at its core, and the holistic, multi-use planning goals designated by the program could allow planning for the future land use realities of a tsunami-impacted community, such as Seaside easier to manage. The challenge of planning based on theoretical models of future damages will be difficult to

[349] Oregon Department of Land Conservation and Development, "Statewide Planning Goals."

[350] Oregon Department of Land Conservation and Development, "Statewide Planning Goals," *Goal 7 Areas Subject to Natural Disasters*, accessed May 12, 2014, http://www.oregon.gov/LCD/docs/goals/goal7.pdf.

manage, but existing land use mechanisms could be invaluable in these needed efforts. The case study communities show that it is perhaps time for a 20th planning goal that addresses public safety and preparedness to bridge the gap between sunny day planning and that occurring after disaster.

Oregon, due to its statewide planning mandates, has extremely talented planners at the local and state level in land use planning. These planners are working piecemeal on different aspects of planning that affect recovery from catastrophic disaster. Additionally, as the state prepares for a CSZ earthquake and tsunami, emergency response, recovery planning, and mitigation/resilience planners are dealing with multiple issues directly related to either existing or future post-event land use issues. The challenge for Seaside and the State of Oregon is in maximizing the strength of these existing planning program areas and fusing the two discipline's very different but extremely complimentary missions.

C. ANSWERING THE QUESTION: WHAT IS THE LIKELIHOOD AND CONSEQUENCE OF NOT REBUILDING AN AMERICAN CITY AFTER CATASTROPHIC DISASTER—THE QUESTION OF ABANDONMENT

1. Abandonment Could Be the Ultimate Risk Management Strategy

Abandonment may ultimately be the best risk management. It immediately removes a population from a hazardous area and allows them to start anew. However, this research identified some problems in simplifying disaster recovery to the question of "should we continue to build there." In authoritarian China, abandonment has been effective after a devastating earthquake in Beichuan in removing a population from a hazardous area, which limited the costs of hazard mitigation and reconstruction. However, this action also has created high rates of Post-Traumatic Stress Disorder (PTSD), anxiety, and depression in survivors as they struggle to reclaim their lives, economic health, and geographical identity.[351]

[351] P. Kun et al., "Prevalence of Post-Traumatic Stress Disorder in Sichuan Province, China After the 2008 Wenchuan Earthquake," *Public Health* 123, no. 11 (November 2009): 703–707.

In the United States, the question of intentionally abandoning a city after a catastrophic natural disaster, despite being potentially logical and cost-effective, is likely a non-starter. The American experience with natural disaster is to respond and recover; understandably, this process is affected by time, finance, willingness of the population, and geopolitical importance of the location as shown in the investigations of the case studies in this research. Despite the conversations of abandoning coastal areas by local Coastal Oregon emergency management professionals and federal emergency support function (ESF) representatives, the forced permanent abandonment of Seaside or other communities are both anathema to the American experience and counterproductive to the economic and physical health of survivors.

2. Not Abandonment, but Diminishment

Historically, the general pattern of "abandoned cities" after a natural disaster is a slow decline unless subjected to an inhospitable for life event, such as the Centralia Pennsylvania mine fires, Pripyat near Chernobyl, or Plymouth Montserrat (known as the "Pompeii of the Caribbean") after being buried by volcanic ash.[352] Diminishment of communities is often an evolutionary process, guided by insightful post-disaster land use planning, not a decision. Two examples of this phenomenon follow.

a. An Example of Diminishment of a City from Antiquity—Antioch

The ancient city of Antioch, its remnants located in modern day Turkey, as shown in Figure 19, is a long-term example of the slow diminishment of a city following catastrophic natural disaster. Prior to its slow decline, Antioch was a city on the scale and importance of the other great Mediterranean cities of Rome and Alexandria. Antioch was described as economically vibrant, full of aristocrats and consumers, and compared to 19th century Paris.[353]

[352] Montserrat Tourist Board, "History of Plymouth," accessed May 1, 2014, http://www.visitmontserrat.com/History_of_Plymouth.

[353] H. V. Morton, *In the Steps of St. Paul* (Cambridge, MA: Da Capo Press, 2002).

> A thousand talents of gold were remitted to the city from the tributes by the emperor; and, besides, to individual citizens, the imposts of the houses destroyed: and that he also took measures for the restoration both of them and of the public buildings.[354]

Figure 19. Location Map of Antioch (Antakya) Turkey[355]

Antioch endured a series of significant devastating earthquakes between 525 and 580 AD; the most significant was the earthquake of 526 AD, estimated to be between VIII (destructive) and IX (violent) on the Mercalli intensity scale.[356] These events were responded to and prior to 588 AD, the city endured through earthquakes, occupation and plague due to financial investment in the rebuilding by Byzantine Emperor Justinian necessary due to the vital geopolitical significance of the city at the borders of the Western and Eastern worlds.[357]

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[354] Evagrius Scholasticus, *The Ecclesiastical History of Evagrius*, trans. Edward Walford (London: Samuel Bagster and Son, 1846), 60.

[355] Created by author using Bing Maps online map tool.

[356] Mohamed Reda Sbeinati, Ryad Darawcheh, and Mikhail Mouty, "The Historical Earthquakes of Syria: An Analysis of Large and Moderate Earthquakes from 1365 B.C. to 1900 A.D," *Annals of Geophysics* 48, no. 3 (June 2005): 347–435.

[357] Phillip J. Palin, "Disasters and Catastrophe at Antioch," *Homeland Security Watch*, accessed May 1, 2014, http://www.hlswatch.com/2010/05/08/disasters-and-catastrophe-at-antioch/.

Another large earthquake hit Antioch in 588 AD and killed approximately 60,000 people;[358] the city was unable to recover from this event and began its gradual decline. In a blog post, Palin suggests it occurred as a result of inter-related factors including the enduring economic impacts of the earthquake and overspending by the Byzantine government leading to a recovering city being less resilient to social upheaval and the impacts of drought and plague occurring after the 588 earthquake.[359] Despite several significant catastrophes in Antioch, no conscious effort was made to abandon the city; it happened gradually as the city lost relevance due to the secondary impacts of intertwined economic, psychological, social, and geopolitical factors. The city lost relevance as the toll from disaster upon disaster added up. Land use planning may also have played a role, with historians questioning the movement of the city's walls to a more mountainous area leading to a less defensible city, ruins of which are shown in Figure 20.[360]

Figure 20. Ruins of Antioch (Antakya) Turkey[361]

[358] Geoffrey Greatrex and Samuel N. C. Lieu, *The Roman Eastern Frontier and the Persian Wars AD 363–628* (New York, NY: Routledge, 2008), 170.

[359] Palin, "Disasters and Catastrophe at Antioch."

[360] Antiochepedia=Musings Upon Ancient Antioch, "Abandoning the Island–The Fatal Mistake," accessed May 6, 2014, http://libaniusredux.blogspot.com/2009/07/abandoning-island-fatal-mistake.html.

[361] Jack Brauer, "Antakya Summit Turkey," *Mountain Photography*, May 15, 2014. http://www.mountainphotography.com/photo/roman-ruins-antakya/.

b. The Diminishment of Galveston, Texas

On September 8, 1900, the city of Galveston, Texas, in the Gulf of Mexico as depicted in Figure 21, was hit by a Category 4 hurricane and large 15-foot storm surge that destroyed much of the city and killed 6,000 of its residents, approximately one of every six Galvestonians. A firsthand account of the event described, "one of the most horrible sights that ever a civilized people looked upon" when telling about half of the city's homes (estimated at 3,000) had been "swept out of existence."[362] The cost of the storm was estimated at more than $30 million, equal to approximately $78 billion dollars in 2005.[363] Figures 22 and 23 depict the immense damage of the storm.

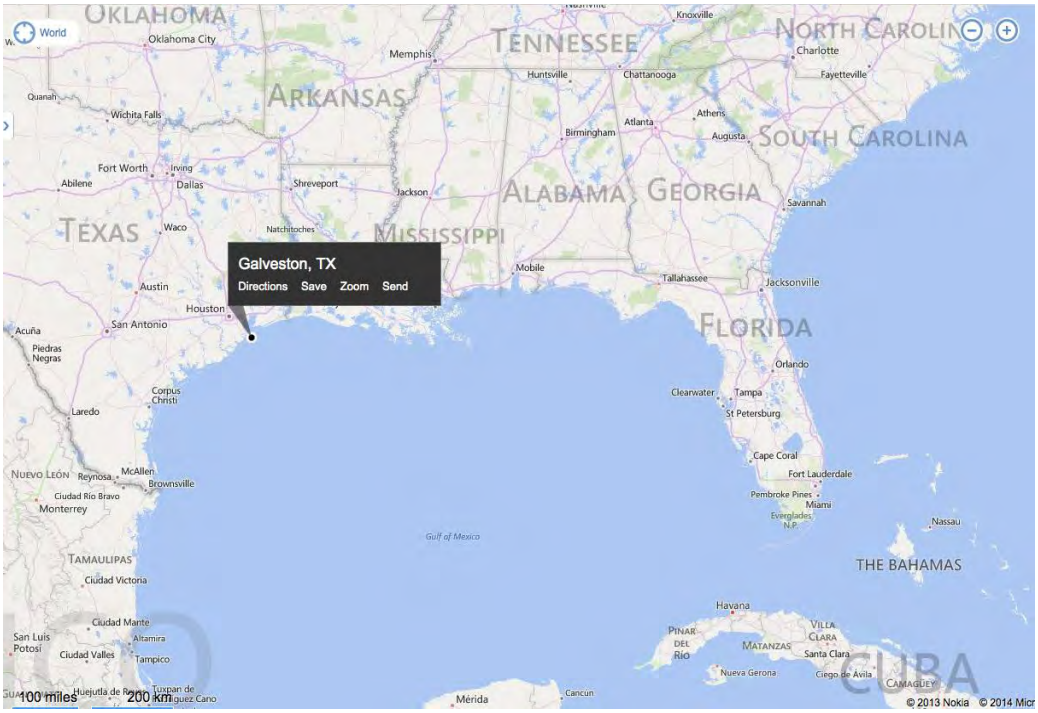

Figure 21. Location Map of Galveston, Texas[364]

362 Isaac M. Cline, *Monthly Weather Review - Special Report on the Galveston Hurricane* (Washington, DC: U.S. Weather Bureau, 1900).

363 Roger A. Jr. Pielke et al., "Normalized Hurricane Damage in the United States: 1900–2005." *Natural Hazards Review (American Society of Civil Engineers)* 9, no. 1 (February 2008): 29–42.

364 Created by author using Bing Maps online map tool.

Surviving residents were faced with the shock of their own personal loss and the horror of the mass fatalities of their neighbors needing to be disposed of for health reasons. The dead were at first disposed of at sea. Later, when some of the bodies began washing ashore, funeral pyres were used to cremate the victims. This undertaking was a brutal task in the warm climate and when volunteers could not be found, some residents were forced at gunpoint to complete this task.[365] Adding to the misery, access to Galveston Island was limited when the bridge to the mainland was destroyed. This isolation reduced response and initial recovery support.[366]

Prior to the hurricane, Galveston was one of the United States' most prestigious cities, known as the "New York of the South." It was one of the wealthiest cities per capita in the nation.[367] It was a city of incredible economic importance to the United States. As Galveston began recovery, sentiments were optimistic that the city would recover. Chase quoted I. H. Kempner, City of Galveston Treasurer, as saying, "I contend there is not the slightest doubt about the city being rehabilitated with a rapidity that will prove almost remarkable."[368]

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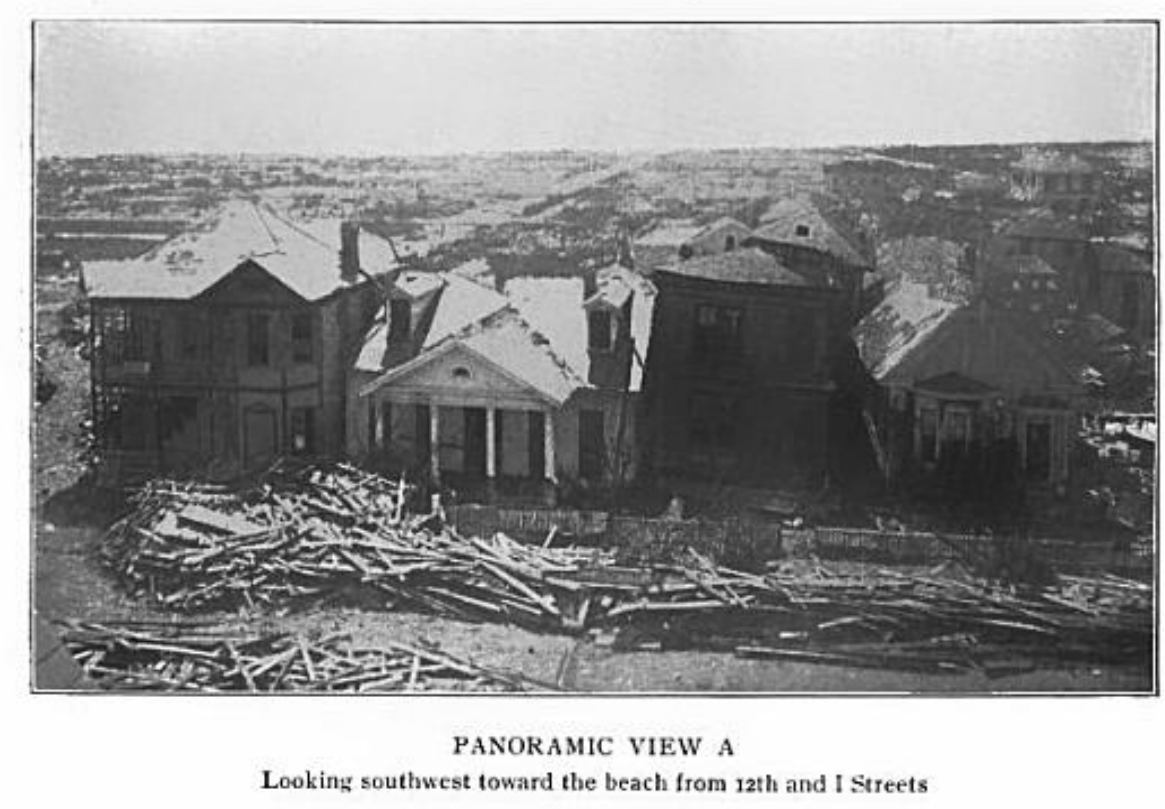
[365] Mary G. Ramos, "Galveston's Response to the Hurricane of 1900," *Texas Almanac*, accessed May 6, 2014, http://www.texasalmanac.com/topics/history/galvestons-response-hurricane-1900.

[366] Ibid.

[367] Mark Thoma, "The Galveston Hurricane of 1900," *Economists View*, accessed May 1, 2014, http://economistsview.typepad.com/economistsview/2005/09/the_galveston_h.html.

[368] William C. Chase, *Galveston in Nineteen Hundred: The Authorized and Official Record of the Proud City of the Southwest as it was Before and After the Hurricane of September 8, and a Logical Forecast of Its Future* (Atlanta, GA: Southern Publishing and Book Co., 1900), 225.



PANORAMIC VIEW A
Looking southwest toward the beach from 12th and I Streets

Figure 22. Panoramic Photo of Galveston after the Hurricane[369]

Galveston underwent dramatic changes to recover from the storm. Responding to dissatisfaction with the management of the city, a recovery committee saw to establishing a new form of municipal government intended to be centralized and efficient to drive physical and economic recovery.[370]

[369] Ibid., 224.

[370] Bradley R. Rice, "The Galveston Plan of City Government by Commission: The Birth of a Progressive Idea," *Southwestern Historical Quarterly* (Texas State Historical Association) 78, no. 4 (April 1975): 365–408.

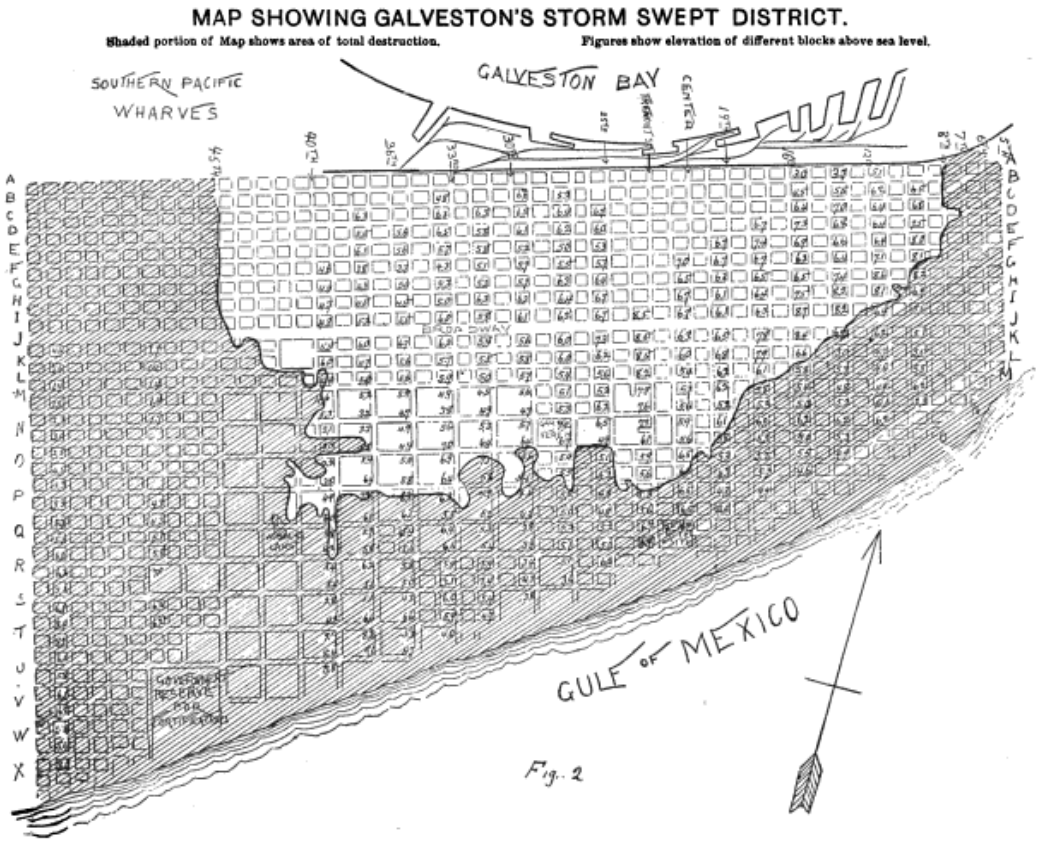


Figure 23. Galveston, Texas, Storm Damage from 1900 Hurricane[371]

The city constructed a three-mile long concrete seawall to stop incoming waves and deflect damage from future storms. Ambitiously, Galveston elevated the city greater than 16 feet as mitigation against storm surge flooding.[372] Recovery occurred quickly, with McComb noting, "In the third week, Houston relief groups went home, the saloons reopened, the electric trolleys began operating and freight began moving through the harbor."[373]

Despite the speed of recovery and the dedication of Galvestonians to return the city to its former glory, the city was vulnerable to the changing economy of early 20th

[371] Chase, *Galveston in Nineteen Hundred: The Authorized and Official Record of the Proud City of the Southwest as it was Before and After the Hurricane of September 8, and a Logical Forecast of Its Future*, 12.

[372] Ramos, "Galveston's Response to the Hurricane of 1900."

[373] David G. McComb, *Galveston: A History* (Austin, TX: University of Texas Press, 1986), 131–132.

century Texas. The City of Houston, approximately 50 miles northwest of Galveston, became the center of the Texas petrochemical industry.[374] The economic fortunes and importance of Galveston moved northwest to Houston. Dredging of the Houston Ship Channel in 1914 continued eroding the economic significance of Galveston.[375] Galveston recovered but has never been the important city it once was. Today, it serves primarily as a beach town and vacation area for Houstonians.[376] Galveston residents and the United States had no intention of abandoning the city despite the devastation to the city. The diminishment of Galveston was unintentional as the economic conditions the city was built upon changed. With the oil industry and the City of Houston's emergence, it is entirely possible that Galveston would have faced decline even without the damage of the 1900 hurricane.

Further research on the social, psychological, geopolitical, and economic challenges of the diminishment of communities following disaster and what economic, sociological, psychological, historical, and political challenges led to their decline, would be useful to identify steps that could limit this phenomenon as part of recovery planning frameworks.

[374] Roger M. Olien, "Oil and Gas Industry," *Texas State Historical Association,* accessed May 9, 2014, https://www.tshaonline.org/handbook/online/articles/doogz.

[375] Thoma, "The Galveston Hurricane of 1900."

[376] Amanda Ripley, "A Brief History of: The 1900 Galveston Hurricane," *Time*, accessed May 6, 2014, http://content.time.com/time/nation/article/0,8599,1841442,00.html.

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VI. CONCLUSIONS

Through the study of the case studies post-disaster actions, insights were gathered in challenges facing reconstruction and recovery. Courses of action were determined that promote decisions benefitting disaster recovery and to avoid those decisions that hindered reconstruction in the studied communities.

Findings of the research were that abandonment was rejected by community actions in the case study communities. Even in Valdez, which had to be moved from a precarious site. Survivors of disaster in those communities, despite their tragic losses, wanted to rebuild, and fought with the government in some cases to stay in their communities. For those survivors leaving the community, or denied the opportunity to participate in its reconstruction, psychological and social issues developed, which impacted the recovery.

The strongest and intertwined trend in the case study communities was the importance of land use planning in planning for, responding to, and recovering from disaster. Based on the case studies and learning from the challenges they faced post-disaster, the conclusion of this research is that land use planning, and producing zoning and comprehensive planning of economic, residential, and industrial locations in a community, is critical to disaster response, resilience, and recovery. For areas subject to natural disaster, or other homeland security concerns, such as terrorism, land use planning should, pre-event, be more intimately interwoven, planning both for development and reconstruction following disaster with emergency management organizations dealing with response and recovery planning. Involvement of the public in the design and implementation of recovery plans was also shown to be a primary catalyst for the successful emergence of communities from disaster.

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